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United States  
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Agriculture

Foreign  
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# Citrus in Mexico

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# FOREWORD

Mexico is the world's fifth largest producer of citrus and the only significant foreign supplier of fresh citrus for the U.S. market. This report analyzes the production, marketing and processing of citrus in Mexico.

The author is grateful for the assistance provided by the Office of the U.S. Agricultural Counselor in Mexico City and the regional office of USDA's Animal and Plant Health Inspection Service (APHIS) in Monterrey, Mexico. Special appreciation is extended to Robert Hardman and Alberto Suarez who are currently with the APHIS Plant Protection and Quarantine (PPQ) Office in Matamoros, Mexico. David B. Fitz, the officer in charge of USDA's Agricultural Marketing Service (AMS) field office in McAllen, Texas, helped collect and analyze the data presented in this report.

Gilbert E. Sindelar  
Director  
Horticultural and Tropical Products Division

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# CITRUS IN MEXICO

By Edmond Missiaen  
Horticultural and Tropical Products Division  
Commodity Programs  
Foreign Agricultural Service

## SUMMARY

Mexico's citrus production expanded rapidly before 1970 but, except for limes, growth was restrained during the 1970's. Most production is destined for the domestic market, but the industry in the State of Nuevo León is geared to meet the demand for fresh citrus exports. Grapefruit and Persian lime production in Veracruz State is also aimed at export markets. Producing areas are scattered over several States, and varying levels of technology—from rudimentary to advanced—are employed in citrus production. Government interference in citrus production and marketing is minimal, especially when compared to other products, especially staple foodstuffs.

Little growth is anticipated in the production of oranges, tangerines, and grapefruit through the mid-1980's. Production of both Persian and Mexican (key) limes, however, is likely to increase substantially during the first half of the decade. The potential for future expansion in citrus production is limited by the availability of water in irrigated areas and, in all areas, by the strong demand for staple foods which could give them a competitive edge over citrus.

Mexico's fresh citrus exports vary widely from year to year. The United States is Mexico's most important foreign market. There appears to be no consistent relationship between U.S. imports from Mexico and possible causal factors such as crop sizes in the entire United States, Texas, and Mexico; prices in the United States and in Mexico City; and exchange rates. Any future growth in exports will be constrained by limited fruit supplies and the strong domestic market.

Processors, who utilize 20 to 25 percent of Mexico's citrus output, are heavily dependent on exports. The United States is the main outlet for exports of processed citrus products, but Western Europe and Canada are also important markets. There is much interest in expanding processing facilities for orange juice, especially among grower groups seeking alternate market outlets. However, both fruit supply and markets could present problems if expansion were to proceed rapidly.

The United States exports small amounts of citrus products to Mexico for consumption in urban centers near the U.S. border.

## INTRODUCTION

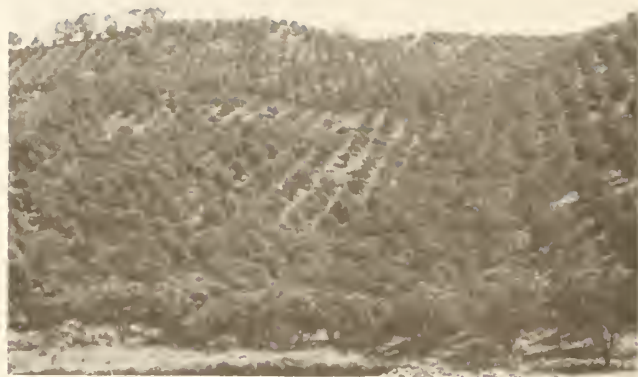
Mexico is the sixth largest producer of citrus in the world, ranking behind the United States, Brazil, Japan, Spain, and Italy. The country, however, has a large and growing domestic market and is, therefore, a relatively minor exporter of citrus and citrus products. Mexican exports are destined for many countries, but more than half goes to the United States.

In recent years, U.S. citrus and citrus product imports from Mexico ranged from \$30 million to \$40 million per year, including an average of \$12 million of fresh fruit, \$10 million of citrus juice, and \$12 million of lime oil (appendix, table 1). Mexico accounts for about 70 percent of U.S. fresh citrus imports, but takes a smaller proportion of processed product imports.





Flood irrigation of Valencia orange trees in Tamaulipas.



A hillside orange grove in San Luis Potosi.



Two-year-old Persian lime trees in Veracruz.



Scene at "La Merced" wholesale citrus market in Mexico City.



# PRODUCTION

## History of Citrus Production

Mexico's 1979/80 citrus production was close to 2.5 million metric tons<sup>1</sup>—probably the best season in the country's history. Citrus production experienced many ups and downs through the 1970's, but on the whole it tended to increase. The following tabulation shows the relative importance of the various types of citrus fruit in Mexico:

Type of Fruit	Production in 1979/80	Rate of Growth 1970/71 to 1979/80
	<i>1,000 Metric Tons</i>	<i>Percent/Year<sup>1</sup></i>
Oranges. . . . .	1,630	1.9
Tangerines. . . . .	180	-0.5
Grapefruit. . . . .	170	14.0
Mexican limes. . . . .	430	5.0
Persian limes. . . . .	52	over 15.0
Total. . . . .	2,463	2.9

<sup>1</sup>Based on trend line analysis.

The most important citrus producing States in 1979/80 were as follows:

State	Citrus Production
	<i>1,000 Metric Tons</i>
Veracruz. . . . .	925
Nuevo León. . . . .	456
Tamaulipas. . . . .	249
San Luis Potosí. . . . .	227
Others. . . . .	606 <sup>1</sup>
Total Mexico. . . . .	2,463

<sup>1</sup>About 70 percent of this figure represents Mexican (key) limes.

Commercial orange production in Mexico started in the late nineteenth century. The Rio Verde area of San Luis Potosí State was probably the first important citrus area. Mexico's first citrus exports allegedly originated from Rio Verde in the mid-1890's, but the first large scale commercial plantings were in the Montemorelos area of Nuevo León, also in the 1890's. Production developed rapidly. At the time

of the devastating freeze of 1962, Nuevo León was the most important producing State, but the freeze killed 20 to 30 percent of the trees and pre-1962 production levels were not reached again until the late 1960's. Nuevo León never recovered its leadership in citrus production. High prices for citrus after the 1962 freeze—which also hit Florida and Texas groves—stimulated the recovery of production in Nuevo León and encouraged increased plantings in other Mexican States.

Citrus production in Veracruz first developed in highland areas in the central part of the State. Coffee was the most important crop in this region and over half of the citrus plantings consisted of seedlings interplanted with coffee. This was Mexico's largest citrus producing area during the 1930's and 1940's, but virtually no commercial citrus remains in the area today. The first commercial citrus planting in the coastal areas of northern and central Veracruz occurred in the 1930's, but heavy plantings did not begin until the mid-1950's. After 1962, planting activity accelerated and continued until the end of the decade. In recent years the only notable expansion of Veracruz citrus plantings has been in Persian limes. A gradual expansion of orange plantings continues near the north coast of the State around Tuxpan and Alamo.

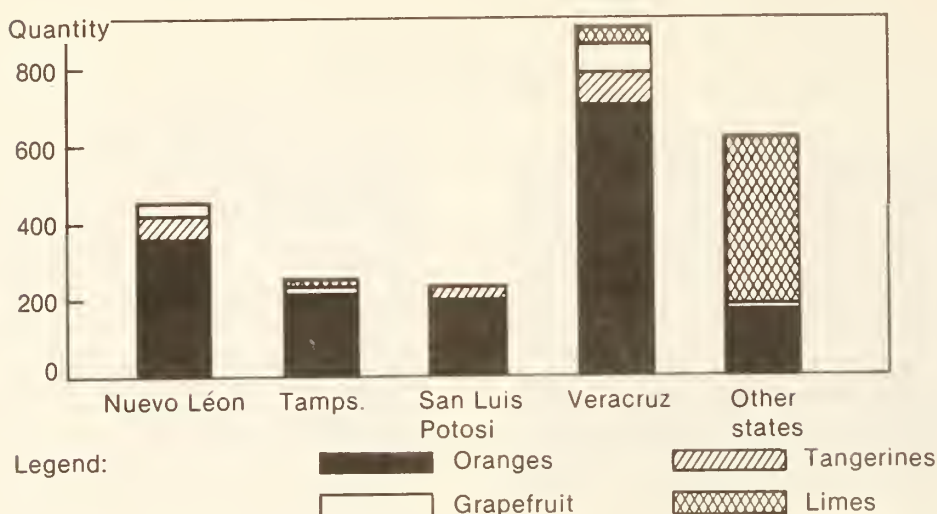
Citrus production in the Rio Verde area of San Luis Potosí has been stagnant or declining since the 1950's. Commercial citrus plantings in the Huasteca Zone of San Luis Potosí, which now accounts for most of that State's citrus, began in the 1950's and accelerated after 1962. At one time, coffee was the most important commercial crop in the area, but it became unprofitable, partly because of the relatively cool winters. The Mexican Coffee Institute encouraged and financed the switch to citrus. The expansion of citrus plantings continued until the late 1960's.

Tamaulipas was a minor commercial citrus area for many years before plantings began to expand. Expansion occurred in the 1950's, after the 1962 freeze, and following the completion of the Vicente Guerrero Dam and Irrigation Project in the early 1970's. In recent years expansion has been slow, but it continues. If a recently announced Government plan is carried out, the State's citrus area would more than double during the next 10 years.

<sup>1</sup>Metric measures are used throughout this report. 1 metric ton = 2,204.62 lbs. 1 hectare = 2.471 acres.

Figure 1

## Mexico: Production of Citrus Fruit By States, 1979/80



Note: Quantities in thousands of metric tons

Horticultural and Tropical Products Division  
Commodity Programs, FAS, USDA

The first commercial plantings of grapefruit in Mexico occurred in the Loma Bonita area along the Veracruz-Oaxaca State boundary during the mid-1940's. Plantings, mainly of the Ruby Red variety, expanded rapidly during the late 1960's and early 1970's in the Veracruz coastal areas, Tamaulipas, and Nuevo León. The limited market was soon saturated, however, and some land was taken out of grapefruit production during the late 1970's.

Mexico's first processing plant for making frozen concentrated orange juice (FCOJ) was established in the highland area of Veracruz near Jalapa and is still operating today. The number of processing facilities grew in the late 1950's, and again throughout the 1970's.

The first commercial groves of Mexican (key) limes were established in the State of Michoacán around 1912. Before then, all of Mexico's lime supplies had been harvested from wild trees. Commercial plantings in the State of Colima—now the largest producing State—started in 1926 and expanded rapidly after World War II to meet the growing demand for essential oil of lime. Plantings continued to increase, especially during the 1960's, but fell off during a period of depressed prices in the early 1970's. They picked up again during the late 1970's.

Persian limes are grown mostly in Veracruz State. Production was minor until the mid-1970's when

plantings increased in response to favorable prices in the U.S. market.

### Area and Production of Citrus

Tables 1 and 2 list basic statistics on the area and production of citrus in Mexico. The data are FAS estimates developed on the basis of field trips through the producing areas and an examination of all available written materials, published and unpublished. Notes on methodology accompany the tables.

Good citrus crops were harvested in all major producing States in 1979/80. The 1978/79 crop year, however, saw mediocre to poor crops of oranges, tangerines, and grapefruit in all of the major producing States. The culprit in all cases was poor weather. There were freezes in December 1978 and January 1979 in Nuevo León which caused losses in later maturing varieties, especially Valencias. Dry weather harmed citrus yields in Veracruz during both the 1977/78 and 1978/79 seasons.

### Characteristics of Principal Producing Regions

Table 3 lists some environmental and other features of Mexico's major citrus producing regions. Rainfall in all areas is heaviest in late spring and in summer (table 3 and figure 3). Average temperatures for key weather stations are shown in figure 4. Table 4 lists the approximate extent of the major citrus producing

Table 1.—Mexico: Area and Production of Citrus by State, 1978/79 and 1979/80

Type of fruit	Nuevo León		Tamaulipas		San Luis Potosí		Veracruz		Others		Total Mexico	
	1978/79	1979/80	1978/79	1979/80	1978/79	1979/80	1978/79	1979/80	1978/79	1979/80	1978/79	1979/80
<b>ORANGES</b>												
Bearing area (ha) . . . . .	28,500	28,500	9,200	9,200	16,200	16,200	58,000	58,000	15,000	15,000	126,900	126,900
Nonbearing area (ha) . . . . .	3,500	3,500	1,700	1,700	1,800	1,800	6,500	6,500	1,400	1,400	14,900	14,900
Total area (ha) . . . . .	32,000	32,000	10,900	10,900	18,000	18,000	64,500	64,500	16,400	16,400	141,800	141,800
Yield (metric tons per ha) . . . . .	10.2	12.3	16.3	22.8	10.5	12.3	8.6	12.1	11.3	11.3	10.1	12.9
Production (metric tons) . . . . .	290,000	350,000	150,000	210,000	170,000	200,000	500,000	700,000	170,000	170,000	1,280,000	1,630,000
<b>TANGERINES</b>												
Bearing area (ha) . . . . .	4,000	4,000	—	—	1,800	1,800	7,700	7,700	—	—	13,500	13,500
Nonbearing area (ha) . . . . .	450	450	—	—	200	200	900	900	—	—	1,550	1,550
Total area (ha) . . . . .	4,450	4,450	—	—	2,000	2,000	8,600	8,600	—	—	15,050	15,050
Yield (metric tons per ha) . . . . .	10.0	17.5	—	—	10.0	13.9	7.8	11.0	—	—	8.7	13.3
Production (metric tons) . . . . .	40,000	70,000	—	—	18,000	25,000	60,000	85,000	—	—	118,000	180,000
<b>GRAPEFRUIT</b>												
Bearing area (ha) . . . . .	1,740	1,740	1,300	1,300	—	—	5,000	5,000	1,000	1,000	9,040	9,040
Nonbearing area (ha) . . . . .	60	60	200	200	—	—	500	500	100	100	860	860
Total area (ha) . . . . .	1,800	1,800	1,500	1,500	—	—	5,500	5,500	1,100	1,100	9,900	9,900
Yield (metric tons per ha) . . . . .	17.2	20.7	19.2	22.3	—	—	15.0	18.0	15.0	15.0	16.0	18.8
Production (metric tons) . . . . .	30,000	36,000	25,000	29,000	—	—	75,000	90,000	15,000	15,000	145,000	170,000
<b>PERSIAN LIMES</b>												
Bearing area (ha) . . . . .	—	—	—	—	90	100	1,700	1,900	—	—	1,790	2,000
Nonbearing area (ha) . . . . .	—	—	—	—	180	200	2,700	3,100	200	300	3,080	3,600
Total area (ha) . . . . .	—	—	—	—	270	300	4,400	5,000	200	300	4,870	5,600
Yield (metric tons per ha) . . . . .	—	—	—	—	25.0	25.0	21.8	26.3	—	—	21.9	26.2
Production (metric tons) . . . . .	—	—	—	—	2,250	2,250	37,000	50,000	—	—	39,250	52,500
<b>MEXICAN (KEY) LIMES</b>												
Bearing area (ha) . . . . .	—	—	1,000	1,000	—	—	—	—	39,000	40,000	40,000	41,000
Nonbearing area (ha) . . . . .	—	—	200	200	—	—	—	—	10,900	12,000	11,100	12,200
Total area (ha) . . . . .	—	—	1,200	1,200	—	—	—	—	49,900	52,000	51,100	53,200
Yield (metric tons per ha) . . . . .	—	—	8.0	9.0	—	—	—	—	10.4	10.5	10.4	10.5
Production (metric tons) . . . . .	—	—	8,000	9,000	—	—	—	—	407,000	421,000	415,000	430,000
<b>LEMONS</b>												
Bearing area (ha) . . . . .	—	—	0	100	—	—	—	—	—	—	0	100
Nonbearing area (ha) . . . . .	—	—	600	500	—	—	—	—	—	—	600	500
Total area (ha) . . . . .	—	—	600	600	—	—	—	—	—	—	600	600
Yield (metric tons per ha) . . . . .	—	—	—	10.0	—	—	—	—	—	—	—	10.0
Production (metric tons) . . . . .	—	—	—	1,000	—	—	—	—	—	—	—	1,000
<b>TOTAL CITRUS</b>												
Bearing area (ha) . . . . .	34,240	34,240	11,500	11,600	18,090	18,100	72,400	72,600	55,000	56,000	191,230	192,540
Nonbearing area (ha) . . . . .	4,010	4,010	2,700	2,600	2,180	2,200	10,600	11,000	12,600	13,800	32,890	33,610
Total area (ha) . . . . .	38,250	38,250	14,200	14,200	20,270	20,300	83,000	83,600	67,600	69,800	223,320	226,150
Yield (metric tons per ha) . . . . .	10.5	13.3	15.9	21.5	10.5	12.6	9.3	12.7	10.8	10.8	10.4	12.8
Production (metric tons) . . . . .	360,000	456,000	183,000	249,000	190,250	227,500	672,000	925,000	592,000	606,000	1,997,250	2,463,500

— Indicates zero or insignificant.

Continued

Table 1.—Continued

- NOTES:**
1. **Nuevo León:** Citrus area is based mostly on an infrared photo study done in 1976 or 1977. Results were reported in Omar Rodríguez Longoria's, *Inventario de Cítricos del Estado de Nuevo León*, a thesis presented to the Agronomy Faculty of Universidad Autónoma de Nuevo León, March, 1979. Trade and Government contacts were pretty much in agreement that the total citrus crop is usually in the neighborhood of 400,000 metric tons. Estimates of the grapefruit and tangerine share of citrus production vary greatly. All agreed, however, that tangerine production was greater than grapefruit. Estimates of the tangerine share varied from 6 to 20 percent with most in 10 to 15 percent range. Estimates of the grapefruit share ranged from 3 to 15 percent, with most estimates below 10 percent.
  2. **Tamaulipas:** Area estimates varied widely, but the most reliable were apparently those of Irrigation District #86 (13,000 ha irrigated) and the growers' union (15,000 ha). Our total citrus production estimate is based largely on marketing information supplied by the growers' union.
  3. **San Luis Potosí:** Citrus production estimates ranged all the way from 100,000 metric tons to 450,000 metric tons. Most contacts, however, would not even hazard a guess as to the amount produced. The better contacts and published sources, however, all agreed on a planted area of around 18,000 to 22,000 ha. Most yield estimates were in the 10 to 15 ton/ha range.
  4. **Veracruz:** Production includes output from adjoining areas in the States of Puebla and Oaxaca. Puebla's production is mostly oranges and tangerines, while Oaxaca's is mainly grapefruit. Contacts in Veracruz provided a hodgepodge of conflicting information. Estimates of total citrus production ranged from 400,000 metric tons to 1.4 million metric tons. Average yield estimates ranged from around 10 metric tons/hectare to over 20 metric tons/hectare. Most, however, were closer to 10 tons/hectare. The information supplied by the regional growers' unions was important in determining our area and production estimates. About 7,000 of the 8,600 hectares in tangerines are in the Martínez de la Torre area. Grapefruit area includes plantings in the traditional citrus zones of Veracruz plus the extreme south of the State and northern Oaxaca (Loma Bonita zone).
  5. **Others:** The other most important States for orange and grapefruit production are Yucatán, Sonora, and Sinaloa.
  6. **Mexican (Key) Limes:** The most important source of information was the 1978/79 lime census made by the Mexican Government agency Fidelim (Lime Trust Fund). See appendix table 1 for more details on Mexican lime production.
  7. **Tree Spacing:** We estimate average planting densities as follows:

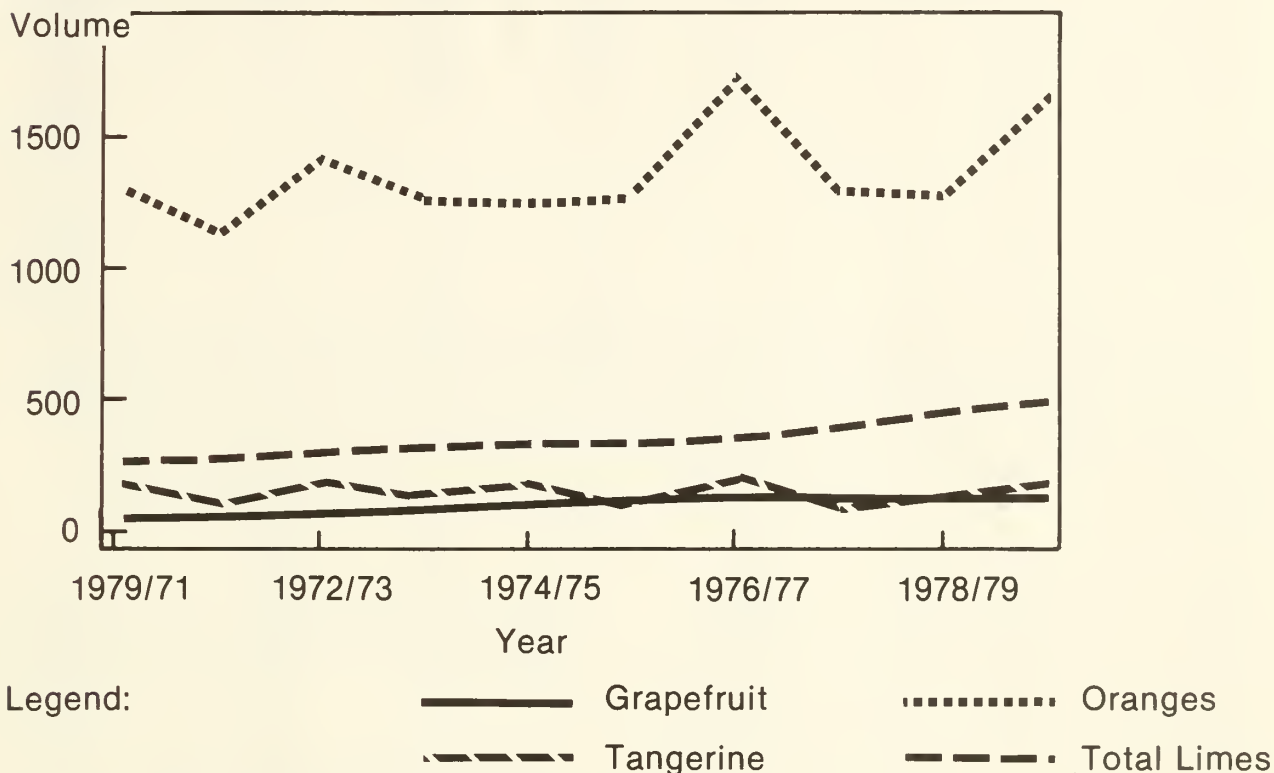
Nuevo León	180 trees/ha
Tamaulipas	170 trees/ha
Veracruz	220 trees/ha
San Luis Potosí	220 trees/ha
Persian limes	450 trees/ha
Mexican limes	100 to 200 trees/ha

Source: Foreign Agricultural Service (FAS) estimates.



Figure 2

## Mexico: Production of Citrus Fruit 1970/71-1979/80



Note: Quantities in thousands of metric tons

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Commodity Programs, FAS, USDA

zones in the principal orange, tangerine, and grapefruit producing States. Figure 5 is a map showing the location of the major producing zones. In 1978/79, the lime area in the principal producing areas on the Pacific Coast was roughly as follows:

State	Hectares
Colima <sup>1</sup> . . . . .	28,000
Michoacán . . . . .	12,000
Guerrero . . . . .	5,000
Oaxaca . . . . .	5,000

<sup>1</sup>Includes about 1,000 hectares in an adjacent area of Michoacán State.

Source: Fidelim, 1978/79 Lime Census.

### Citrus Varieties

Tables 5 and 6 show the principal varieties of citrus fruit produced in Mexico and their peak harvest seasons. Pertinent comments on each type of citrus follow:

**Oranges:** Valencias dominate orange production in all States except Nuevo León where early and midseason varieties are also important. For Nuevo León growers the early season fruit provides insurance against winter freeze losses and supplies fruit for the early season export market. More than one early season variety is often planted in the same block of trees. Oranges can be kept on the tree into the summer months in irrigated areas, especially in Tamaulipas, but in other areas the harvest season is relatively short because fruit quality

Table 2.—Mexico: Citrus Production by States, 1970/71–1980/81

Type of fruit	Nuevo León	Tamaulipas	San Luis Potosí	Veracruz	Others	Total Mexico
<b>ORANGES</b>	<i>1,000 metric tons</i>					
1970/71 . . . . .	360	140	180	530	100	1,310
1971/72 . . . . .	290	100	140	500	100	1,130
1972/73 . . . . .	350	190	200	560	110	1,410
1973/74 . . . . .	300	150	190	520	120	1,280
1974/75 . . . . .	200	120	170	600	140	1,230
1975/76 . . . . .	250	130	120	630	150	1,280
1976/77 . . . . .	350	280	200	720	160	1,710
1977/78 . . . . .	320	170	180	450	170	1,290
1978/79 . . . . .	290	150	170	500	170	1,280
1979/80 . . . . .	350	210	200	700	170	1,630
1980/81 . . . . .	320	200	160	750	170	1,600
<b>TANGERINES</b>						
1970/71 . . . . .	90	—	15	65	—	170
1971/72 . . . . .	35	—	9	60	—	104
1972/73 . . . . .	90	—	17	70	—	177
1973/74 . . . . .	70	—	17	60	—	147
1974/75 . . . . .	85	—	22	70	—	177
1975/76 . . . . .	30	—	12	65	—	107
1976/77 . . . . .	85	—	25	75	—	185
1977/78 . . . . .	50	—	15	40	—	105
1978/79 . . . . .	40	—	18	60	—	118
1979/80 . . . . .	70	—	25	85	—	180
1980/81 . . . . .	50	—	16	54	—	120
<b>GRAPEFRUIT</b>						
1970/71 . . . . .	8	16	—	20	10	54
1971/72 . . . . .	6	12	—	20	10	48
1972/73 . . . . .	12	18	—	30	10	70
1973/74 . . . . .	14	18	—	35	10	77
1974/75 . . . . .	30	20	—	40	10	100
1975/76 . . . . .	23	22	—	50	15	110
1976/77 . . . . .	30	25	—	70	15	140
1977/78 . . . . .	28	22	—	60	15	125
1978/79 . . . . .	30	25	—	75	15	145
1979/80 . . . . .	36	29	—	90	15	170
1980/81 . . . . .	39	29	—	80	15	163
<b>PERSIAN LIMES</b>						
1970/71 . . . . .	—	—	0	10	—	10
1971/72 . . . . .	—	—	0	10	—	10
1972/73 . . . . .	—	—	0	10	—	10
1973/74 . . . . .	—	—	0	12	—	12
1974/75 . . . . .	—	—	1	13	—	14
1975/76 . . . . .	—	—	1	14	—	15
1976/77 . . . . .	—	—	2	16	—	18
1977/78 . . . . .	—	—	2	24	—	26
1978/79 . . . . .	—	—	2	37	—	39
1979/80 . . . . .	—	—	2	50	—	52
1980/81 . . . . .	—	—	3	58	—	61
<b>MEXICAN LIMES</b>						
1970/71 . . . . .	—	10	—	—	320	330
1971/72 . . . . .	—	10	—	—	300	310
1972/73 . . . . .	—	10	—	—	260	270
1973/74 . . . . .	—	10	—	—	260	270
1974/75 . . . . .	—	10	—	—	290	300
1975/76 . . . . .	—	10	—	—	290	300
1976/77 . . . . .	—	10	—	—	310	320
1977/78 . . . . .	—	11	—	—	350	361
1978/79 . . . . .	—	8	—	—	407	415
1979/80 . . . . .	—	9	—	—	421	430
1980/81 . . . . .	—	8	—	—	461	469

Continued



Table 2.—Mexico: Citrus Production by States, 1970/71–1980/81—Continued

Type of fruit	Nuevo León	Tamaulipas	San Luis Potosí	Veracruz	Others	Total Mexico
<b>LEMONS</b>	----- 1,000 metric tons -----					
1979/80 .....	—	1	—	—	—	1
1980/81 .....	—	2	—	—	—	2
<b>TOTAL CITRUS</b>						
1970/71 .....	458	166	195	625	430	1,874
1971/72 .....	331	122	149	590	410	1,602
1972/73 .....	452	218	217	670	380	1,937
1973/74 .....	384	178	207	627	390	1,786
1974/75 .....	315	150	192	723	440	1,820
1975/76 .....	303	162	133	759	455	1,812
1976/77 .....	465	315	227	881	485	2,373
1977/78 .....	398	203	197	574	535	1,907
1978/79 .....	360	183	190	672	592	1,997
1979/80 .....	456	249	228	925	606	2,463
1980/81 .....	409	239	179	942	647	2,416

**NOTES:** Estimates for 1970/71 are based upon FAS estimates made by Gilbert E. Sindelar and James H. Starkey after a field trip in 1971. Their figures were used in most cases, but adjustments were made where evidence warranted. The most important source for yearly changes in production were estimates and comments made by David B. Fitz, Officer in Charge, USDA, Agricultural Marketing Service Field Office, McAllen, Texas. Production estimates for 1978/79 and 1979/80 are based upon a February/March 1980 field trip (see table 1). Tamaulipas estimates for 1974/75 to 1977/78 rely heavily upon marketing data supplied by the growers' association (union) in Victoria. Production in "Other States" assumes stagnant production in Sonora and Sinaloa but rapidly increasing production in Yucatán due to heavy plantings around 1970.

See appendix table 1 for 1960/61-1969/70 citrus production estimates.

deteriorates rapidly late in the season. The outward appearance of oranges from Nuevo León and Tamaulipas is usually superior to those from San Luis Potosí and Veracruz.

**Tangerines:** Tangerine trees in Mexico tend to be short-lived and are alternate-year bearing. Tangerine research at the National Citrus Research Center in General Terán, Nuevo León is concentrating on identifying varieties with less of an alternate-year bearing pattern. In Veracruz, most of the tangerine plantings are located in the Martínez de la Torre Zone, especially in the higher elevation areas (200 to 600 meters) in the zone's western extremity.

**Grapefruit:** Plantings were heavy in the late 1960's and early 1970's (see "Foreign Agriculture," April 16, 1973), but by the late 1970's the market had become glutted and some growers pulled up trees or grafted them to oranges or limes. Most Mexican grapefruit is pink fleshed, mainly the Ruby Red variety, but in the Loma Bonita zone of Veracruz and Oaxaca white grapefruit predominates. The Loma Bonita groves are said to be semi-abandoned, but there is still a relatively large quantity of fruit. Elsewhere in Veracruz, grapefruit is concentrated in the Tuxpan and Alamo areas and Gutierrez Zamora Zones.

**Persian Limes:** In 1980 only 30 to 40 percent of Mexico's Persian lime plantings had begun to bear. Most of the plantings are in the State of Veracruz. The heaviest concentration is in the Martínez de la Torre Zone, which reportedly accounts for over half of the plantings in the State. There are also some plantings near Ciudad Valles in San Luis Potosí and near the city of Autlán in Jalisco State. Persian limes have been planted with an eye on the U.S. market—Mexican consumers prefer Mexican limes. Growers have been planting Persian limes since the late 1960's, but the heaviest plantings have been during 1977-80. About 20 percent of plantings during the late 1970's are said to have been made by top working (grafting onto) grapefruit and orange trees. By 1981 new plantings of Persian limes had reportedly ceased.

**Mexican (Key) Limes:** The market for Mexican limes and lime oil—about 45 percent of output is processed for essential oil—was depressed in the early 1970's, but by 1980 the market had become favorable and plantings were increasing. Colima is the most important and dynamic producing State. Production in the Apatzingán Zone of Michoacán, where there are many alternative agricultural activities, has been stagnant for many years and a large proportion of groves there are reportedly abandoned.

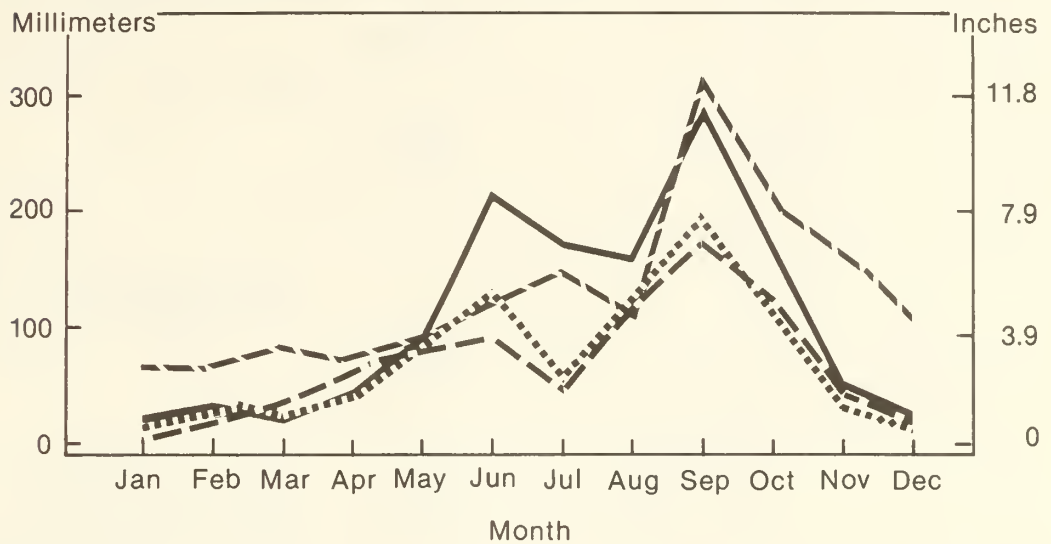
Table 3.—Mexico: Characteristics of Principal Citrus Growing Regions

	Nuevo León	Tamaulipas	San Luis Potosí	Veracruz	Colima	Michoacán
Altitude (meters) <sup>1</sup> . . . . .	300-700	200-400	Huasteca 100-500 Rio Verde 1,000	Sea level-500	Sea level-200	300-800
Rainfall (millimeters) <sup>2</sup> . . . . .	700-800	600-800	Huasteca 1,200-1,500 Rio Verde 600-700	1,000-2,000	700-900	600-800
Freeze danger . . . . .	Yes	Yes	Huasteca—No Rio Verde—Yes	No	No	No
Miscellaneous weather problems . . .				24-72 hour violent cold wind storms during the winter		
Topography . . . . .	Flat	Flat	Huasteca—70% of groves on steep mountainsides; Rio Verde—flat	Flatlands—60-70%, Hillsides—30-40%		
Competing agricultural activities . . .	Few; pecans of some importance	Santa Engracia/El Carmen—grains and oilseeds; Llera—sugar- cane	Huasteca—cattleland; Rio Verde—diversi- fied area, many crops	North Coastal Zone— cattleland and bananas; Loma Bonita—primarily a pineapple area	Bananas	Cotton, melons, vegetables

<sup>1</sup> 1 meter = 3.281 feet.    <sup>2</sup> 1 inch = 25.4 millimeters (mm).

Figure 3

### Mexico: Average Monthly Precipitation in Selected Locations

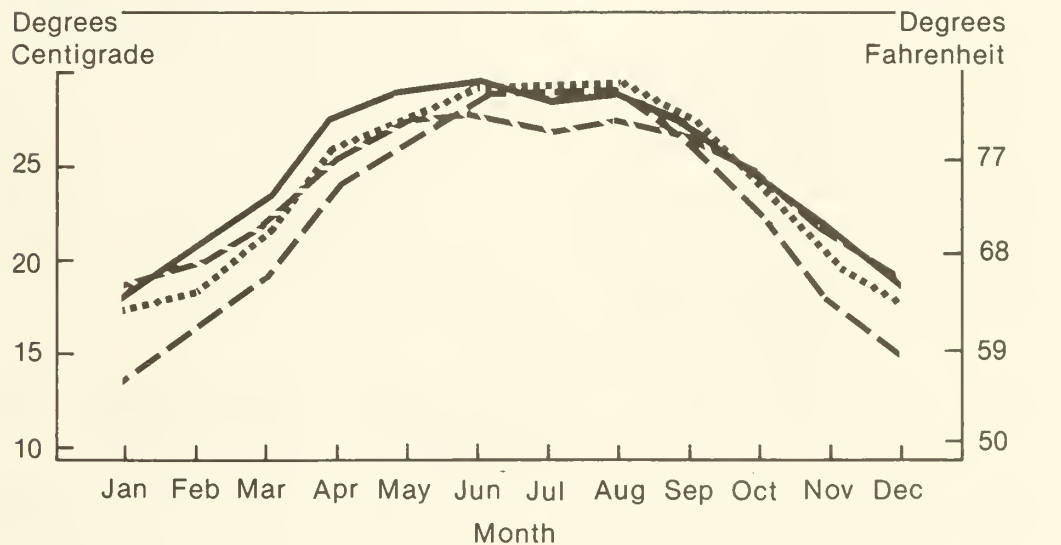


Legend: Ciudad Valles Ciudad Victoria  
Martinez de la Torre Montemorelos

Horticultural and Tropical Products Division  
Commodity Programs, FAS, USDA

Figure 4

### Mexico: Average Monthly Temperatures in Selected Locations



Legend: Ciudad Valles Ciudad Victoria  
Martinez de la Torre Montemorelos

Horticultural and Tropical Products Division  
Commodity Programs, FAS, USDA

Table 4.—Mexico: Citrus Zones Within the Principal Citrus Producing States

State	Zone	Approximate Area in Citrus	Comments
Nuevo León . . . . .	Montemorelos	— — <i>hectares</i> — — — 32,000	
	Linares	6,000	
Tamaulipas . . . . .	Santa Engracia/El Carmen (area north of Victoria)	11,000	
	Llera	2,000	About 60% in Mexican limes; Government operates a lime oil distillery here.
	Chamal	1,000	Nonirrigated. Located east of Ciudad Mante.
San Luis Potosí . . . . .	Huasteca	18,300	
	Rio Verde	2,000	
Veracruz . . . . .	North Coastal Zone:		
	Alamo/Tuxpan	30,000	Follows Tuxpan River Valley and, to a lesser extent, the Cazones River Valley.
	Gutierrez Zamora	20,000	Follows Tecolutla River Valley.
	Martínez de la Torre	25,000	Extends into adjacent areas of Puebla State. Follows Nautla River Valley. Eastern extremity of zone extends into mountain foothills.
	Loma Bonita	4,000	Extends into adjacent areas of Oaxaca State. Mostly grapefruit, some Persian limes.
	Rest of State	4,600	Widely dispersed throughout State.

Table 5.—Mexico: Principal Citrus Varieties, by States

State	Oranges	Tangerines	Grapefruit	Limes
Nuevo León . . . . .	Early & midseason varieties (include Hamlin, Parson Brown, Pineapple, Marrs, and Navel—40-50%; Valencia—50-60%)	Dancy—close to 100%	Ruby Red—90%; Marsh Seedless—10%	
Tamaulipas . . . . .	Valencia—85-90%		Ruby Red—close to 100%	Mexican
San Luis Potosí . . .	Valencia—90%; Early & midseason (mostly "corriente" & San Miguel)—10%	Dancy—close to 100%		
Veracruz . . . . .	Valencia—80-90%	Dancy—90%; Others (include King Mandarin & Monica)—10%	Ruby Red—70%; Marsh Seedless & other white fleshed varieties—30%	Persian—close to 100%
Colima & Michoacán				Mexican—close to 100%

# Mexico





Table 6.—Mexico: Peak Citrus Harvest Months, by States

State	Oranges	Tangerines	Grapefruit	Limes
Nuevo León . . . . .	October-June	November-January	November-May	
Tamaulipas . . . . .	December-August		November-May	
San Luis Potosí . . .	January-May	October-January		
Veracruz . . . . .	January-April	October-January	August-March	Year round <sup>1</sup>
Colima & Michoacán				Year round but heaviest April-December <sup>2</sup>

<sup>1</sup> Persian limes. <sup>2</sup> Mexican limes.

**Lemons:** In Tamaulipas, about 100 growers planted a total of 600 hectares of lemons between 1974 and 1979. These plantings were jointly promoted by the Government and a large beverage maker who intends to utilize all of the lemons produced for making essential oil of lemon which is a key soft drink ingredient.

## Technology

Only a minority of growers in Mexico follow all recommended techniques for citrus growing. The use of

these techniques increases when citrus prices are favorable, but even then they are not used by a large number of small, marginal producers. Thus, there is potential for greatly improving yields just by spreading adoption of currently available technology.

**Tree Spacing and Cultural Practices:** Trees are planted mostly in square patterns of 9 meters by 9 meters, 8 meters by 8 meters, 7 meters by 7 meters, 6 meters by 6 meters, etc.; but they are also planted in triangular or rectangular patterns. Average tree spacing is as follows:

State	Most Common Spacing(s) (Meters)	Estimated Average Density Per Hectare
Nuevo León . . . . .	8 x 8	180
Tamaulipas. . . . .	8 x 8	170
San Luis Potosí . . . . .	6 x 6 (mountain sides) 8 x 8 (valley floor)	220
Veracruz: Persian limes. . . . .	4 x 4, 4 x 5	450
Others . . . . .	7 x 7, 8 x 8 x 8	220
Colima . . . . .	9 x 9, 10 x 10	100
Michoacán . . . . .	8 x 8, 9 x 9	120

In Colima, 70 percent of the Mexican (key) lime area is interplanted with other crops, mainly coconuts.

**Root Stocks:** Sour orange is the most commonly used rootstock throughout Mexico. Most of the Mexican lime trees in the Pacific Coast States (Colima, Michoacán, Guerrero, and Oaxaca) are seedlings, but growers in Colima are now switching over to budded trees. In 1978/79, 20 percent of all lime trees and 50 percent of nonbearing lime trees in Colima were budded, mostly on sour orange, but some also on Troyer. In Michoacán, only 1 percent of

all trees and 6 percent of nonbearing trees were on budded stock. No budded stock was in use in Guerrero or Oaxaca lime groves.

**Irrigation:** Irrigation is important in the drier citrus growing zones of Mexico. Most of the water is drawn from rivers and privately maintained irrigation canals. However, 40 percent of the water for irrigated citrus in Tamaulipas is supplied by a Government-run project. Water from wells is often used to supplement river water. In Nuevo Leon, about 10 to 15 percent of the irrigation water is from wells.



The flood system of irrigation is practiced in all areas. In Nuevo León about 1,000 hectares of groves (equal to 4 percent of the State's irrigated citrus area) are watered with pressurized systems—drip, microjet, or under-tree sprinklers.

The proportion of citrus area under irrigation, by States, is as follows:

State	Percent	Note
Nuevo León . . . . .	70	—
Tamaulipas. . . . .	90-95	all except small area in southern part of State
San Luis Potosí		
Río Verde Zone. . . . .	100	
Huasteca Zone. . . . .	3-5	small areas near city of Valles are irrigated
Veracruz . . . . .	insignificant	small area near Veracruz City is irrigated
Sinaloa & Sonora . . . . .	100	—
Yucatán . . . . .	50	—
Colima & Michoacán . . . . .	100	—
Guerrero & Oaxaca . . . . .	zero	—

Some growers in rainfed areas, such as Veracruz, are now considering irrigation as a guarantee against losses in dry years and as a method of controlling the time of the bloom.

**Fertilization:** Probably no more than one-half of Mexican citrus growers use fertilizer regularly. Fertilizer use, however, increases when citrus prices are favorable.

The majority of growers with irrigated groves in Nuevo León and Tamaulipas fertilize on a regular basis with NPK, but the use of micronutrients is not widespread. Most of the citrus in the Huasteca Zone of San Luis Potosí is not fertilized. In Veracruz, one-half or less of the growers fertilize their groves on a regular basis.

The Government of Mexico maintains a monopoly on the production of fertilizers and requires that they be sold at fixed prices. In 1980, fertilizer prices in Nuevo León were 40-60 percent less than average prices in the United States. Prices compared as follows:

Fertilizer	Nuevo León, Mexico	United States <sup>1</sup>
	<i>Dollars per metric ton<sup>2</sup></i>	
Ammonium nitrate . . . . .	113	186
Sulfate of ammonia. . . . .	64	152
Urea . . . . .	140	251
Single superphosphate . . . .	61	146
Triple superphosphate . . . .	159	277
18-46-0. . . . .	200	328

<sup>1</sup> Average prices on May 15, 1980. <sup>2</sup> Pesos converted to dollars at 23 per U.S. dollar.

Source: Mexican data from a fertilizer dealer in Montemorelos, Nuevo León. U.S. data from the Crop Reporting Board, Economics & Statistics Service, USDA.

**Disease Problems:** Most serious disease problems in Mexican citrus are foot rot, psorosis, greasy spot, and anthracnose. Foot rot or gummosis is found throughout Mexican citrus areas. Recommended treatments include use of proper rootstocks and grafting methods, improvements in irrigation techniques, surgery, and elimination of the most seriously affected trees. Gummosis is especially serious in Colima where Mexican lime growers have responded by replanting with budded stock. Psorosis affects all citrus except Mexican limes. Affected trees are not treated. The best remedy is to use virus-free bud wood. This disease reduces the life span of citrus trees and is partly responsible for the rapid decline of tangerines which in Veracruz, reportedly happens after 12 years.

Greasy spot appears throughout the country but is most prevalent in humid areas, especially Veracruz and the Huasteca Zone of San Luis Potosí. It has a negative effect on yields, but is not usually treated. This disease is considered to be a less serious problem than either foot rot or psorosis. Anthracnose is endemic only in the Mexican lime areas. It is treated with fungicides. There is no tristeza in Mexico, but trees grafted to the almost universally used sour orange rootstock are highly susceptible to the disease.

**Insect Pests and Pest Control:** The insect pest causing the most damage in citrus groves is the Mexican fruit fly. This pest attacks oranges, tangerines, and grapefruit, but is most troublesome with grapefruit. It does not attack limes. It can be controlled by a regular spraying program, a practice followed in most irrigated groves in Nuevo León and Tamaulipas. In Veracruz only about a third of the growers regularly spray to control the Mexican fruit fly, and very few growers spray in San Luis Potosí. The number of growers using chemical sprays to control the Mexican fruit fly and other troublesome pests such as the rust mite and aphids varies according to the market price for citrus.

The citrus black fly, which attacks the leaves of citrus fruit trees, is now controlled with the release of a parasite. It is no longer considered a serious problem.

**Weed Control:** Mexican citrus growers use very little herbicide for weed control. The flood method of irrigation which requires cleaning the area under the trees before watering, keeps weeds well under control in irrigated groves. In other areas, weeds are generally kept down by mowing and cultivating.

**Pruning:** Mexican citrus growers do not mechanically hedge or top their groves. Except for removing dead wood, little pruning is done in Nuevo León or Tamaulipas. In the humid growing areas of Veracruz and the Huasteca Zone of San Luis Potosí many growers prune heavily to keep branches away from the ground and to thin out the inside. The more progressive growers do not follow this practice. Well cared for Mexican lime groves are usually pruned every year or two.

## Characteristics of Citrus Growers

There are about 35,000 citrus growers in Mexico who maintain groves on around 225,000 hectares of land (table 7). Three-quarters of these growers are ejidatarios who control 40 to 45 percent of the land in citrus. The remaining growers are private property owners.

Ejidatarios are beneficiaries of Mexico's agrarian reform program which was initiated after the Mexican Revolution of 1910-20. They are members of rural communities called ejidos which have the right to use a designated parcel of state-owned land. In citrus growing areas, plots within the ejidos are usually assigned on a permanent basis to each member family. Ejidatarios tend to be less well educated and to have less access to purchased agricultural inputs and to technical advice than private property owners. Groves in ejidos are universally small and probably range from 1 to 10 or 12 hectares.

Private property owners range from poor peasant farmers with no more resources than ejidatarios to the owners of large groves with tens of thousands of trees. The agrarian reform laws, however, place upper limits on private farmland ownership. Although family members often pool their ownership rights to form relatively large parcels, the largest holdings probably do not exceed 300 or 350 hectares. The larger holdings are usually divided among more than 1 block of trees. More typical are privately owned groves in the range of 10 to 40 hectares. The existence of many very small groves, however, keeps the average grove size down to the lower end of the range.

An infrared photo survey of the Nuevo León citrus area in 1976 and 1977 revealed 6,298 individual groves. It is likely, however, that the number of grove owners is substantially less than this, because many own more than 1 block of citrus. The proportion of

Table 7.—Mexico: Citrus Grower Characteristics, 1979/80

Region and State	Number of Growers			Citrus Grove Ownership		Average Size of Citrus Holdings	
	Ejiditarios	Private	Total	Ejiditarios	Private	Ejiditarios	Private
<b>MEXICAN LIME AREAS<sup>1</sup></b>	<i>Number</i>			<i>Percent of Area</i>		<i>Hectares</i>	
Colima . . . . .	1,800	480	2,280	29	71	7	41
Michoacán . . . . .	1,720	270	1,990	53	47	4	21
Others <sup>2</sup> . . . . .	3,760	0	3,760	100	0	2-3	—
Subtotal . . . . .	7,280	750	8,030	49	51	—	—
<b>OTHER CITRUS AREAS<sup>3</sup></b>							
Nuevo León . . . . .	900	2,700	3,600	10	90	3-5	10-15
Tamaulipas . . . . .	1,700	450	2,150	50	50	4-5	15-20
San Luis Potosí . . . . .	4,700	500	5,200	70	30	3	15-20
Veracruz . . . . .	9,500	3,000	12,500	45	55	3-5	15
Others <sup>4</sup> . . . . .	2,700	600	3,300	55	45	2-5	12-15
Subtotal . . . . .	19,500	7,250	26,750	42	58	—	—
Total Mexico . . . . .	26,780	8,000	34,780	43	57	—	—

<sup>1</sup> Data from 1978/79 Lime Census conducted by the Fidecomismo de Limón (Fidelim), an agency of the Mexican Government.

<sup>2</sup> Includes 3,048 growers with 5,054 hectares of groves in Guerrero, and 716 groves with 5,276 hectares of groves in Oaxaca. The growers in Oaxaca are all comuneros, i.e., indigenous Mexicans farming community held land. In the table they are grouped together with ejiditarios.

<sup>3</sup> Data obtained on field trip, February and March, 1980 and from review of available written sources. <sup>4</sup> Include Yucatán, Sonora, Sinaloa, and other minor producing States. In Yucatán and Sinaloa, most citrus growers are ejiditarios, and in Sonora most are private property owners.

Source: FAS estimates.

Nuevo León's citrus area in various size groves was as follows:

Grove Size (hectares)	Number of Groves	Percentage of Total Citrus Area
Less than 1. . . . .	2,166	3
1- 4.99 . . . . .	2,240	16
5- 9.99 . . . . .	868	17
10-14.99 . . . . .	394	13
15-19.99 . . . . .	233	11
20-24.99 . . . . .	126	8
25 and over . . . . .	253	32
Total . . . . .	6,298	100

Source: Rodríguez, p. 33.

About 35 percent of Mexico's growers are active members of various local, regional, and State citrus grower associations.<sup>2</sup> Grower cooperatives are not widespread.

<sup>2</sup>Ramírez, p. 32.

## Government Assistance

**Research:** The principal agricultural research entity in the Mexican Government is the National Agricultural Research Institute (INIA) which maintains the National Orange, Tangerine, and Grapefruit Research Center in General Terán, Nuevo León and the National Lime Research Center in Tecomán, Colima. The INIA also sponsors citrus research at experiment stations in Culiacán, Sinaloa, and Uxmal, Yucatán. Future plans call for extending citrus research activities to stations in Veracruz, Tamaulipas, Michoacán, and Oaxaca.

The National Fruit Commission (CONAFRUT) maintains a citrus research and experimentation center in Guemez, Tamaulipas. The Government-controlled Citrus and Tropical Fruit Trust Fund<sup>3</sup> sponsors lime production research at its demonstration farm in Tecomán, Colima.

The most significant Government-sponsored agricultural extension work in citrus areas is done by the agents of the Secretariat of Agriculture and Hydraulic Resources (SARH) Plant Health Division (Sanidad

<sup>3</sup> Formerly Lime Trust Fund (Fidelim)



Vegetal) which has experts scattered throughout the citrus producing areas. Local CONAFRUT offices also provide growers with technical assistance and low-priced agricultural inputs. Growers of Mexican limes receive technical assistance from agents of the Citrus and Tropical Fruit Trust Fund.

**Credit:** Government banks supply citrus growers with credit on more favorable terms than commercial banks, but larger growers often use the latter to avoid delays and other inconveniences associated with subsidized funding. In some regions, the Government banks have special programs aimed at reaching small, marginal citrus growers and providing them with a combination of credit and technical assistance.

**Price Supports:** There are no Government price support programs for citrus or citrus products.

### Potential for Increased Production

Mexico's citrus plantings and citrus production increased rapidly in the 1950's and 1960's but, except for limes, there was little growth during the 1970's. Given the relatively small numbers of nonbearing orange, tangerine, and grapefruit trees in 1980—about 10 percent—little growth is anticipated in these varieties through the mid-1980's. Lime production, however, should increase substantially during the next several years. In 1980, nonbearing acreage was over 60 percent of the area in Persian limes and 20-25 percent of the area in Mexican limes. Much of the anticipated growth in lime production will be destined for export, either as fresh Persian limes or as essential lime oil.

Limited expansion of orange and tangerine plantings is occurring in Tamaulipas and in the north coastal area of Veracruz, near Tuxpan and Alamo.<sup>1</sup> Elsewhere, the nonbearing orange, tangerine, and grapefruit trees generally represent no net growth in citrus area. They are replacement trees within existing groves, or new groves that merely compensate for other abandoned groves. Some expansion could take place in nontraditional areas, especially along the Southern Gulf Coast. Private entrepreneurs began to plant near the town of Chontalpa in Tabasco State in the late 1970's. By 1980, about 300 hectares had been planted, mostly to Ruby Red and Star Ruby grapefruit and to Persian limes. The attraction of planting in this area, which was a maximum potential

of probably 2,000 to 3,000 hectares, is that the grapefruit matures very early (late July) and earns high prices in export markets. Other possible areas for expansion are in the vicinity of the city of Veracruz and on the Yucatán Peninsula. The biggest drawback to the major expansion of citrus area in Tabasco and the Yucatán Peninsula are their relative isolation from markets, both foreign and domestic. Little or no expansion is anticipated in the Pacific Northwest States of Sonora and Sinaloa because of the strong competition from alternative crops.

Future growth in citrus plantings will be determined by: (1) grower returns for citrus; (2) the grower returns and Government incentives for alternative crops; and (3) in some areas, the availability of irrigation water.

Future price levels for citrus cannot be determined, but given Mexican Government policies, returns for some alternative agricultural activities are likely to improve relative to citrus. Mexican production of staple foods—corn, sorghum, wheat, oilseeds, dry beans, etc.—has not kept up with demand in recent years. The result has been an unprecedented level of agricultural imports which have strained the country's balance of payments and its transportation and food distribution system. The Mexican Government's response has been to provide the economic incentives, know-how, and infrastructure necessary to increase domestic production of staple foods. Thus, growing staple crops could become more attractive, relative to citrus, in some areas.

Given prevailing water management techniques, the availability of water precludes the expansion of irrigated citrus in Nuevo León, and limits irrigated citrus expansion in Tamaulipas to about 10 to 20 percent of the current area (without cutting into the area of other crops). If irrigated citrus area were expanded in these States, more water-efficient irrigation systems, such as drip or micro-jet, would have to be used. A good deal of experimental work in irrigation techniques, other than the normal flood system, is being conducted in research centers and by growers. A few growers in Nuevo León have put in alternative systems, but high installation costs are limiting widespread adoption.

The potential for increasing per tree or per hectare citrus yields in Mexico is great, but progress is likely to be slow. Average orange yields now range from 10 to 20 metric tons per hectare depending on the State or year, and they averaged about 13 tons per hectare for all of Mexico in 1979/80. This compares to recent average annual yields ranging from 30 to 55 tons per hectare in Florida, 19 to 25 tons in California, 14 to

<sup>1</sup>The Government reportedly has plans to promote the planting of 15,000 hectares of citrus, mostly Valencia oranges, in Tamaulipas and 10,000 hectares in Yucatán. The likelihood of fulfilling these plans is unknown.

22 tons in Texas, and 13 to 19 tons in São Paulo, Brazil.

Much of the research by Mexican research institutions is aimed at improving citrus yields. The major cause of low average yields, however, lies in the failure to use available technology such as virus-free budwood and other disease control methods, adequate fertiliza-

tion, and spraying to control insect pests. Reaching the Mexican grower with technical assistance is, however, a difficult problem. The large number of small-scale growers makes direct contact with all but a minority an impossibility. In addition, the limited financial resources of most growers and the wide year-to-year swings in prices discourage investment and heavy use of purchased inputs.

## UTILIZATION

### Overview

Table 8 shows a 10-year series for supply and distribution of oranges, tangerines, grapefruit, and limes. Note that exports play a relatively minor role in the total distribution of the crop—oranges 2 to 4 percent, tangerines 10 to 20 percent, grapefruit about 10 percent, and limes about 3 percent. Processing now accounts for 15 to 20 percent of orange production, up to a third of grapefruit production, and about 40 percent of lime production. Domestic utilization of fresh citrus varies according to availability.

### Marketing of Fresh Citrus for Domestic Consumption

Mexican citrus growers market their fruit in a variety of ways. Most oranges, tangerines, and grapefruit for domestic consumption are marketed through middlemen who generally purchase the fruit on the tree, pick it, and load it loose into 10 metric ton trucks for transport to wholesale markets in the major urban centers. In some places, especially where groves are small and inaccessible, like the Huasteca Zone of San Luis Potosí, middlemen purchase the fruit placed at roadside. Often there are two middlemen, one at the local level who purchases fruit from growers and a second who buys fruit from the first and transports it to urban centers.

Oranges, tangerines, and grapefruit for the domestic, fresh market are not usually cleaned or sorted, and only tangerines are boxed. The exceptions are fruit destined for the northwestern States of Sonora and Baja California which require packed, fumigated fruit and some supermarket chains which buy a portion of their supplies from packinghouses that clean and wax the fruit, but do not size or box it.

Most fruit marketed in the Mexico City area passes through that city's La Merced wholesale fruit and vegetable market. At La Merced, trucks that hold 10 tons of loose citrus gather in a large parking lot 6 mornings a week after making the overnight haul from the growing areas of Veracruz and other States. An average of 200 truckloads of citrus per day is

negotiated during the peak February-April season, but volume dips to as low as 20 or 30 trucks per day during the summer months. La Merced is a distribution point not only for Mexico City and environs, but also for several other cities, some as distant as Acapulco. Many cities, however, particularly those in the north, have their own wholesale citrus markets.

Mexican (key) limes, from Colima and other growing areas in western Mexico, are marketed differently than the citrus from eastern Mexico.<sup>4</sup> Limes are most commonly sold by growers directly to lime packers and processors, with the grower being responsible for picking and hauling. About one-third of the production, however, is sold in the grove to middlemen. Most fresh lime packing facilities are run in conjunction with lime oil distilleries, although a few separate packinghouses do exist. About 70 percent of the Mexican limes destined for the domestic fresh fruit market are sorted and packed in boxes before being shipped to urban centers.

During the 1970's, estimated per capita consumption of citrus fruits fluctuated greatly from year to year, but for the decade as a whole it increased only for grapefruit (table 9). Mexican consumers tend to use fresh oranges and grapefruit for home juicing. Thus the physical appearance of the fruit often is not as important as its perceived juice content. Limes are widely used for seasoning foods and the Mexican lime is much preferred over Persian limes.

### Fresh Citrus Exports

**Export Trends:** Mexican exports of oranges and grapefruit are shown in tables 10 and 11. The United States and East Germany are the principal foreign markets for oranges. Grapefruit exports are destined for the United States, Western Europe, and Japan.

<sup>4</sup>Material on Mexican lime marketing is mostly from Marcos Peralta Porras, "La Comercialización de Frutas con Énfasis en Cítricos," in Manuel del Castillo Turín, ed., *Memoria del Seminario de Citricultura efectuado en Monterrey, N.L. del 28 de Mayo al 1 de Junio de 1979*, Mexico City, 1979.

Table 8.—Mexico: Production and Utilization of Citrus Fruit, 1970/71–1980/81

(1,000 Metric Tons)

Fruit and Year	Production	Utilization		
		Fresh		Processing
		Exports <sup>1</sup>	Apparent Domestic Consumption	
<b>ORANGES</b>				
1970/71 . . . . .	1,310	27	1,188	95
1971/72 . . . . .	1,130	43	997	90
1972/73 . . . . .	1,410	48	1,192	170
1973/74 . . . . .	1,280	48	1,057	175
1974/75 . . . . .	1,230	39	1,031	160
1975/76 . . . . .	1,280	11	1,369	140
1976/77 . . . . .	1,710	13	1,416	281
1977/78 . . . . .	1,290	35	1,040	215
1978/79 . . . . .	1,280	21	1,002	257
1979/80 . . . . .	1,630	27	1,376	227
1980/81 (forecast) . . . .	1,600	20	1,350	230
<b>TANGERINES</b>				
1970/71 . . . . .	170	19	151	( <sup>2</sup> )
1971/72 . . . . .	104	7	97	( <sup>2</sup> )
1972/73 . . . . .	177	24	153	( <sup>2</sup> )
1973/74 . . . . .	147	20	127	( <sup>2</sup> )
1974/75 . . . . .	177	22	155	( <sup>2</sup> )
1975/76 . . . . .	107	16	91	( <sup>2</sup> )
1976/77 . . . . .	185	32	153	( <sup>2</sup> )
1977/78 . . . . .	105	18	87	( <sup>2</sup> )
1978/79 . . . . .	118	22	96	( <sup>2</sup> )
1979/80 . . . . .	180	19	161	( <sup>2</sup> )
1980/81 (forecast) . . . .	120	13	107	( <sup>2</sup> )
<b>GRAPEFRUIT</b>				
1970/71 . . . . .	54	2	37	15
1971/72 . . . . .	48	3	30	15
1972/73 . . . . .	70	6	49	15
1973/74 . . . . .	77	6	56	15
1974/75 . . . . .	100	8	72	20
1975/76 . . . . .	110	5	90	15
1976/77 . . . . .	140	11	109	20
1977/78 . . . . .	125	12	86	27
1978/79 . . . . .	145	13	67	65
1979/80 . . . . .	170	20	86	64
1980/81 (forecast) . . . .	163	20	83	60
<b>LIMES<sup>3</sup></b>				
1970/71 . . . . .	340	2	258	80
1971/72 . . . . .	320	2	248	70
1972/73 . . . . .	280	2	188	90
1973/74 . . . . .	272	2	170	100
1974/75 . . . . .	314	3	191	120
1975/76 . . . . .	315	4	201	110
1976/77 . . . . .	338	5	243	90
1977/78 . . . . .	387	9	208	170
1978/79 . . . . .	454	12	262	180
1979/80 . . . . .	482	15	267	200
1980/81 (forecast) . . . .	530	20	310	200

<sup>1</sup> Oranges and grapefruit: Official Mexican Government statistics for calendar years with 1970 represented as 1970/71. Tangerines: Derived from U.S. imports in fiscal years under regulations administered by Plant Protection and Quarantine Programs, APHIS, USDA, in Foreign Agricultural Trade of the United States, USDA, ESS, various issues. Estimates in this table are 5 percent higher than U.S. import numbers to account for exports to other destinations. Limes: Equal to U.S. imports according to the U.S. Bureau of the Census. <sup>2</sup> About 5,000 to 10,000 tons are processed every second year, but this number is included with processed oranges. <sup>3</sup> Includes both Mexican and persian limes.

Source: USDA estimates.



Table 9.—Mexico: Estimated Per Capita Consumption  
of Fresh Citrus, 1970/71–1979/80

(Kilograms Per Capita)

Year	Oranges	Tangerines	Grapefruit	Limes
1970/71 . . . . .	22.6	2.9	0.7	4.9
1971/72 . . . . .	18.4	1.8	0.6	4.6
1972/73 . . . . .	21.2	2.7	0.9	3.3
1973/74 . . . . .	18.2	2.2	1.0	2.9
1974/75 . . . . .	17.1	2.6	1.2	3.2
1975/76 . . . . .	22.0	1.5	1.4	3.2
1976/77 . . . . .	21.9	2.4	1.7	3.8
1977/78 . . . . .	15.5	1.3	1.3	3.1
1978/79 . . . . .	14.5	1.4	1.1	3.8
1979/80 . . . . .	19.1	2.3	1.2	3.8

Source: Calculated from data in table 8.

Table 10.—Mexico: Exports of Fresh Oranges, 1970-79

(Metric Tons)

Year	Country of Destination						Total
	Argentina	Canada	G.D.R. <sup>1</sup>	Netherlands	U.S. <sup>2</sup>	Others	
1970. . . . .	475	143	4,457	16	21,636	—	26,727
1971. . . . .	285	600	14,992	—	27,055	1	42,933
1972. . . . .	704	1,212	15,980	—	30,134	45	48,075
1973. . . . .	5,785	1,514	16,743	—	24,148	248	48,438
1974. . . . .	2,780	510	18,464	180	16,828	4	38,766
1975. . . . .	1,569	—	4,002	53	5,203	1	10,828
1976. . . . .	—	107	7,393	301	4,866	—	12,667
1977. . . . .	—	52	17,220	376	17,407	2	35,057
1978. . . . .	304	82	3,232	256	16,616	147	20,637
1979. . . . .	1,128	62	—	—	25,336	22	27,355

<sup>1</sup> East Germany. <sup>2</sup> May include some exports for other countries that were transhipped through the United States.

Source: Official trade statistics of Mexico.

Table 11.—Mexico: Exports of Fresh Grapefruit, 1970-79

(Metric Tons)

Year	Country of Destination							Total
	Argentina	Canada	France	Japan	Netherlands	U.S. <sup>1</sup>	Other	
1970. . . . .	414	145	—	—	—	1,712	—	2,271
1971. . . . .	—	—	—	87	—	2,692	—	2,779
1972. . . . .	306	22	—	—	—	5,197	—	5,525
1973. . . . .	946	43	—	—	—	4,617	95	5,701
1974. . . . .	3,519	—	367	—	257	3,807	343	8,293
1975. . . . .	775	—	154	121	545	3,301	134	5,030
1976. . . . .	—	386	513	373	2,056	7,144	311	10,783
1977. . . . .	300	—	1,090	90	4,126	6,003	25	11,634
1978. . . . .	380	998	470	3,073	5,122	3,071	108	13,222
1979. . . . .	3,070	733	1,146	16	7,165	7,144	1,033	20,307

<sup>1</sup> May include some exports for other countries that were transshipped through the United States.

Source: Official trade statistics of Mexico.

The United States is the only important export market for tangerines and limes.

U.S. imports of fresh citrus from Mexico are shown in tables 12 and 13 on a marketing year basis. In 1979/80 imports of citrus fruit from Mexico repre-

sented less than 2 percent of U.S. domestic fresh citrus utilization. This was a small but important share because a large proportion of imports are marketed early in the season when prices are most favorable. Lime imports from Mexico accounted for 40 percent of U.S. fresh lime utilization in 1979/80.

Table 12.—United States: Imports of Fresh Citrus from Mexico, 1970/71–1979/80

Year	Oranges and Tangerines <sup>1 2</sup>		Grapefruit <sup>2</sup>		Limes <sup>3</sup>	
	<i>Metric Tons</i>	<i>\$1,000</i>	<i>Metric Tons</i>	<i>\$1,000</i>	<i>Metric Tons</i>	<i>\$1,000</i>
1970/71 . . . . .	37,769	NA	1,707	NA	1,902	NA
1971/72 . . . . .	34,460	NA	1,732	NA	1,557	NA
1972/73 . . . . .	41,654	5,984	3,275	972	1,574	301
1973/74 . . . . .	38,237	6,122	3,470	1,034	2,259	493
1974/75 . . . . .	27,412	5,449	2,531	799	3,331	937
1975/76 . . . . .	20,501	3,753	1,667	631	3,759	1,252
1976/77 . . . . .	41,651	10,041	5,298	1,496	5,188	1,808
1977/78 . . . . .	26,525	6,024	2,410	664	9,443	2,764
1978/79 . . . . .	41,507	8,951	1,432	363	11,602	2,990
1979/80 . . . . .	33,218	7,529	4,260	1,251	15,148	4,796

Note: NA indicates not available.

<sup>1</sup> Data on oranges and tangerines are not available separately before 1978. <sup>2</sup> October–September.  
<sup>3</sup> April–March.

Source: U.S. Department of Commerce, Bureau of Census.

Table 13.—United States: Imports of Oranges and Tangerines From Mexico, 1978/79 and 1979/80

Year <sup>1</sup>	Oranges		Tangerines	
	<i>Metric Tons</i>	<i>\$1,000</i>	<i>Metric Tons</i>	<i>\$1,000</i>
1978/79. . .	20,381	4,097	21,126	4,854
1979/80. . .	14,269	3,083	18,949	4,446

<sup>1</sup> October-September.

Source: U.S. Department of Commerce, Bureau of Census.

Note that the U.S. import data in table 14 are from an alternate source—data on the imports inspected under the Plant Protection and Quarantine (PPQ) Programs of the U.S. Department of Agriculture. This table is included because Bureau of Census data from the U.S. Department of Commerce did not separate orange and tangerine imports before 1978.

In summary, tables 10 through 14 show that during the 1970's, Mexican exports of oranges and tangerines tended to stagnate while exports of grapefruit and limes tended to increase. During this decade, little or no growth is expected in orange or tangerine exports, gradual increases in grapefruit exports are

possible, and lime exports are likely to continue their rapid growth.

**Trade Facilities:** All oranges, tangerines, and grapefruit exported to the United States must be fumigated in packinghouse facilities approved by USDA Plant Protection and Quarantine (PPQ) inspectors. Limes, which are not a host for the Mexican fruit fly, do not need to be packed in USDA approved facilities. Packinghouses are most heavily concentrated in the Montemorelos area of Nuevo León State, but are scattered through the four major citrus producing States.

Twenty-eight of these packinghouses are united in a trade association, the Mexican Association of Citrus Packers. The association includes all but one of the packers in Nuevo León, one in Tamaulipas, one in Veracruz, and one in San Luis Potosí. Three of the packinghouses, two in Veracruz and one in San Luis Potosí, began operations during the 1980/81 season. Packinghouses are often owned and operated by a group of medium-sized growers, or in a few places, by one large grower. Packinghouses often finance small-scale growers in return for the right to purchase fruit.

Table 14.—United States: Imports of Fresh Citrus from Mexico under Regulations Administered by Plant Protection and Quarantine Programs, APHIS, USDA, Fiscal Years 1961-1980

(Metric Tons)

Year <sup>1</sup>	Oranges	Tangerines	Grapefruit	Limes
1960/61 . . . . .	5,549	2,468	—	2,865
1961/62 . . . . .	8,280	2,703	—	2,572
1962/63 . . . . .	24,756	3,741	713	2,462
1963/64 . . . . .	51,653	5,138	407	2,149
1964/65 . . . . .	41,984	5,220	714	1,920
1965/66 . . . . .	16,415	6,375	41	1,777
1966/67 . . . . .	11,177	8,154	15	1,450
1967/68 . . . . .	53,513	8,811	16	1,282
1968/69 . . . . .	29,637	18,939	245	1,484
1969/70 . . . . .	15,695	11,014	889	2,262
1970/71 . . . . .	22,425	18,112	1,155	1,564
1971/72 . . . . .	25,456	6,791	2,036	1,703
1972/73 . . . . .	24,668	23,007	3,355	1,859
1973/74 . . . . .	20,196	19,445	3,147	3,226
1974/75 . . . . .	8,191	20,711	3,842	3,432
1975/76 . . . . .	5,126	15,292	2,332	4,769
1976/77 . . . . .	16,706	30,374	5,544	7,786
1977/78 . . . . .	9,034	16,889	2,115	9,841
1978/79 . . . . .	19,702	20,634	1,878	13,357
1979/80 . . . . .	13,745	17,921	6,158	16,620

<sup>1</sup> Years beginning in July for 1960/61 through 1975/76 and years beginning in October for 1976/77 through 1979/80.

Source: USDA, Economics and Statistics Service, *Foreign Agricultural Trade of the United States*, various issues.

Table 15.—Eastern Mexico: USDA/PPQ Approved Fresh Citrus Packinghouses, 1981

State	Zone	Locality	Number
Nuevo León . . . . .	Montemorelos	Montemorelos	17
		Allende	3
		General Teran	2
	Linares	Linares	3
		Hualahuises	1
Tamaulipas . . . . .	Santa Engracia/El Carmen	El Barretal	1
San Luis Potosí . . .	Huasteca	Ciudad Valles	1
		Matlapa	1
Veracruz . . . . .	Alamo/Tuxpan	Tuxpan	1
	Guitierrez Zamora	Coatzintla	1
	Martinez de la Torre	San Rafael	1
		Martinez de la Torre	2
Grand total . . .			34

Source: U.S. Department of Agriculture, Plant Protection and Quarantine Programs (PPQ).

Export orders for the United States and overseas markets are the principal business of Mexican citrus packers, but they also pack for the northwestern Mexican States which accept only fumigated fruit. In addition, they prepare bulk shipments of washed and waxed fruit for supermarkets throughout Mexico. Roughly speaking, about half of the fruit processed by fresh fruit packers is destined for export and half for domestic customers. Citrus is packed only in response to specific orders for fruit. All packed citrus is transported by truck. The principal U.S. port of entry is Hidalgo, Texas, which is about 3 hours driving time from the Montemorelos area of Nuevo León.

There is no export tax on fresh citrus exports, and no export permit is required. There are no other Government incentives for exports.

**Exports to U.S. and Canadian Markets:** Mexican citrus exports to the United States and Canada have traditionally been channelled through brokers in the lower Rio Grande Valley of Texas. This, however, has begun to change in recent years. Now, increasing numbers of Mexican packers are exporting directly to consuming centers in North America. Some packers are owners or part-owners of brokerage houses in Texas, while others continue to export through traditional brokers. U.S. brokers often advance operating capital to their Mexican suppliers.

U.S. imports of Mexican oranges, tangerines, and grapefruit fluctuate from year to year. It is difficult to determine, however, which combination of factors causes changes in import levels. Recent bumper crops

in the United States have been associated with lower imports from Mexico, but regression analyses for 10- and 20-year periods indicate that changes in the entire U.S. crop or the Texas crop can explain no more than 30 percent of the year-to-year variation in imports. Other variables that were analyzed include U.S. prices, prices in Mexico City, exports to third countries, and Mexican production. No one variable or combination of them was decisive in explaining the level of U.S. imports of oranges, tangerines, or grapefruit from Mexico.

**Overseas Exports:** When preparing overseas shipments, most Mexican packers are able to run only the fruit for that shipment. They are unable to prepare orders for U.S. delivery until the overseas order has been put together. Under the auspices of the Citrus Packers' Association, several packers are able to work together to assemble the large orders for overseas shipment.

Exports to Argentina are usually embarked on shallow draft ships in the Mexican port of Tampico. Mexican exports to Argentina benefit from favorable tariff treatment through the auspices of the Latin American Integration Association (LAIA, formerly LAFTA). Export shipments to East Germany and Western Europe are generally embarked at the Texas port of Brownsville, because deeper draft ships are able to call at that port. Shipments for Japan are trucked to California and embarked at Long Beach. Table 16 gives an idea of the quantities of Mexican orange and grapefruit exports that are transshipped through the United States.



Table 16.—United States: Entries of Fresh Oranges and Grapefruit for Export or Transportation and Export, Supervised Under Regulations Administered by Plant Protection and Quarantine, APHIS, USDA, Fiscal Years 1973–1980<sup>1</sup>

(Metric Tons)

Year <sup>2</sup>	Oranges	Grapefruit
1972/73. . . . .	19,057	973
1973/74. . . . .	17,330	1,349
1974/75. . . . .	17,865	1,002
1975/76. . . . .	3,998	2,414
1976/77. . . . .	11,059	6,679
1977/78. . . . .	12,453	9,186
1978/79. . . . .	6,911	12,208
1979/80. . . . .	633	5,505

<sup>1</sup> Mostly fruit from Mexico but includes some fruit from Israel and other countries. <sup>2</sup> Years beginning in July for 1972/73 through 1975/76 and years beginning in October for 1976/77 through 1979/80.

Source: USDA, Economics and Statistics Service, *Foreign Agricultural Trade of the United States*, various issues.

**Orange Exports:** Practically all of Mexico's fresh orange exports are from the State of Nuevo León, although a small amount also comes from Tamaulipas. Overseas exports, which are mainly destined for East Germany, are usually of early and midseason oranges. Exports to the United States are spread through the entire October to June season. In recent years, most Valencia exports reportedly have gone to California where they are used in supermarket juicing machines.

**Tangerine Exports:** Mexican tangerine exports, virtually all of the Dancy variety, are destined almost exclusively for the United States and Canada. The export season runs from October through January. During the early weeks of the season, export supplies come from the States of Veracruz and San Luis Potosí. Some of the export tangerines from these States are packed in Nuevo León and some are packed at their origin. The trend is toward more packing in the producing States. Nuevo León tangerines are later maturing, but as soon as they become available they take over most export business. U.S. importers believe that Nuevo León tangerines, which account for about two-thirds of all Mexican exports, have a longer shelf life than fruit from other states. Because there is no tangerine production in Texas, imported Mexican tangerines tend to complement the offerings of Texas fresh citrus shippers.

**Grapefruit Exports:** Most of Mexico's grapefruit exports originate in the State of Veracruz. Ruby Red is the principal variety shipped. Fruit for export is packed in both Veracruz and Nuevo León, but the tendency is for a larger proportion to be packed in Veracruz. The principal shipping season is September to November, before large amounts of fruit are available from other suppliers and prices, therefore, are higher. In some years, however, relatively large shipments are made to the United States during December to May. These late season exports often come from groves in Nuevo León.

There is much interest among some entrepreneurs in maximizing returns from exports by shipping as early as possible. Generally speaking, the farther south the producing region, the earlier the grapefruit matures. With this in mind, some growers have planted Ruby Red and Star Ruby grapefruit in Tabasco State, where fruit can be harvested as early as July. The first commercial fruit in this region was picked in 1979/80. By 1980, about 300 hectares had been planted, but plans for additional plantings could bring the total area up to as much as 2,500 hectares.

**Persian Lime Exports:** Mexican exports of Persian limes, destined almost exclusively for the United States, have increased rapidly in recent years. Most exports originate in and are packed in Veracruz, although small amounts also come from San Luis Potosí, and new plantings in Jalisco State should soon be yielding fruit for export. Limes are shipped year round. Because limes are not a host to the Mexican fruit fly and do not have to be fumigated before export to the United States, packers are not required to operate from facilities approved and inspected by the U.S. Department of Agriculture.

## Orange and Grapefruit Processing

In Mexico, processing plays a secondary role to the fresh market. Processors utilize only 15 to 20 percent of orange production and about 30 percent of grapefruit production. Because of the dominance of the fresh market, processors usually have to compete with fresh market buyers for fruit supplies. Thus, with the exception of some bumper crop years, the cost of oranges and grapefruit for processing tends to be only slightly lower than fruit destined for fresh consumption in the domestic market. Table 17 shows estimated quantities of oranges and grapefruit used for processing.

**Concentrate Juice Processing Facilities:** There are nine processing plants now in operation which can produce frozen concentrated orange juice and grapefruit juice (FCOJ and FCGJ). Most of the processing capacity is in the States of Nuevo León and Veracruz.

Table 17.—Mexico: Estimated Utilization of Oranges and Grapefruit by Processors, 1970/71–1979/80

(1,000 Metric Tons)

Year	Oranges <sup>1</sup>			Grapefruit			Total Oranges and Grapefruit
	For FCOJ <sup>2</sup>	For Sections	Total	For FCGJ <sup>2</sup>	For Sections	Total	
1970/71 . . . .	95	( <sup>3</sup> )	95	15	( <sup>3</sup> )	15	110
1971/72 . . . .	90	( <sup>3</sup> )	90	15	( <sup>3</sup> )	15	105
1972/73 . . . .	170	( <sup>3</sup> )	170	15	( <sup>3</sup> )	15	185
1973/74 . . . .	175	( <sup>3</sup> )	175	15	( <sup>3</sup> )	15	190
1974/75 . . . .	160	( <sup>3</sup> )	160	20	( <sup>3</sup> )	20	180
1975/76 . . . .	140	( <sup>3</sup> )	140	15	( <sup>3</sup> )	15	155
1976/77 . . . .	280	1	281	18	2	20	301
1977/78 . . . .	210	5	215	20	7	27	242
1978/79 . . . .	250	7	257	50	15	65	322
1979/80 . . . .	220	7	227	50	14	64	291

<sup>1</sup>Includes a small amount of tangerines. <sup>2</sup>FCOJ—frozen concentrated orange juice; FCGJ—frozen concentrated grapefruit juice. <sup>3</sup>Insignificant.

Source: USDA estimates.

In addition to the operating plants shown in table 18, there is a small plant capable of producing frozen concentrated grapefruit juice in the Loma Bonita area of Oaxaca, but in recent years it has produced only pineapple juice, and a small plant in Sinaloa which produces only canned, single strength juice. The capacity of Mexico's operating orange and grapefruit concentrate plants is now over 500,000 tons of fruit per year. The largest amount of citrus ever processed in one year was about 300,000 tons, but many of these plants also process other fruits, especially pineapple.

All of the plants now operating are owned by Mexican private entrepreneurs. Two of Nuevo León's plants are in Morelos and one is near Monterrey. The largest plant in the State was expanded for the 1980/81 season and now has 24 high speed extractors and 80,000 pounds per hour of water-evaporating capacity. This plant is owned by about 100 grower-partners, some of whom also own fresh fruit packinghouses. In 1980/81, it was the only Mexican plant which had bulk storage tanks for FCOJ. The largest plant in Veracruz, with 13 extractors and 30,000 pounds per hour evaporating capacity, is located near San Rafael in the Martinez de la Torre Zone. Other Veracruz plants are in Coatepec, near Poza Rica, and in Los Robles. The latter plant, with only 4 extractors, is the smallest in the State.

As of early 1981, there were two small citrus processing plants under construction. A small group of growers was building a plant in Allende, Nuevo León,

and the Mexican Government's agricultural credit bank was financing a plant in Oxcutzcab, Yucatán.

As of 1981, proposals for at least five other new processing plants had been advanced. Prospects for fruition of these plans, most of which involve Mexican Government financing, are quite uncertain. Grower groups have lobbied for the construction of these plants because they feel the need for marketing alternatives.

Mexico's citrus processing season runs from October to May. Plants can start running grapefruit in October and then switch to early season oranges in November. Processors often shut down in January, after the end of the early and midseason orange harvests and before large quantities of Valencias become available. Some plants use this period to process pineapples or other fruit. Small amounts of tangerines—5,000 to 10,000 tons—are processed during "on seasons," that is, years of large crops. No tangerines are processed during "off seasons."<sup>5</sup>

There is no set system for fruit purchases by processors. Generally, they buy fruit delivered to the plant by middlemen or growers, but some also buy fruit on the tree. Packinghouse culls are an important source of fruit, especially in Nuevo León. The large grower-owned plant in Morelos takes deliveries

<sup>5</sup>Tangerines are included with the totals for processed oranges in tables 8, 17, and 19.



Table 18.—Mexico: Location and Capacities of Plants for Producing Concentrated Citrus Juices, 1980/81

Category and State	Plants	Total Extractors	Total Evaporating Capacity
<b>OPERATING PLANTS</b>	<i>Number</i>	<i>Number</i>	<i>Lbs. of Water/Hr.</i>
Nuevo León . . . . .	3	41	70,500
Tamaulipas <sup>1</sup> . . . . .	1	3	5,000
Veracruz . . . . .	4	31	105,000
Sonora . . . . .	1	5	5,000
Total . . . . .	9	80	185,500
<b>PLANTS UNDER CONSTRUCTION</b>			
Nuevo León . . . . .	1	6 or 8	10,000
Yucatán . . . . .	1	5	10,000
Total . . . . .	2	11 or 13	20,000
<b>PROPOSED PLANTS<sup>2</sup></b>			
Nuevo León . . . . .	1	9	15,000
Tamaulipas . . . . .	1	6	15,000
San Luis Potosí . . . . .	1	6	15,000
Veracruz . . . . .	2	23(?)	55,000(?)
Total . . . . .	5	44(?)	100,000(?)

<sup>1</sup> Located in border city of Reynosa, not in citrus producing zone. <sup>2</sup> As of early 1981, only the Tamaulipas proposal was close to getting underway.

Source: FAS survey.

only from its grower-partners. During the 1979/80 season, processors were paying about \$40 or \$50 per metric ton of oranges, on-the-tree basis, which was equivalent to \$1.60 or \$2.00 per 90-pound box. This was roughly one-half of 1979/80 season prices in Florida, and slightly higher than 1980 season prices in São Paulo, Brazil. Pick and haul costs in 1979/80 were around \$17 to \$22 per ton (70 to 90 cents per box). During the 1980/81 season, processors in Nuevo Leon paid around \$50 to \$60 per ton, delivered to the plant for early and mid-season oranges, but Valencia prices were up to \$85 or \$90 per ton, delivered.

**Production of Frozen Concentrated Orange Juice (FCOJ):** In recent years, Mexican production of FCOJ has averaged around 20,000 metric tons of 65° brix concentrate (equivalent to 6.6 million gallons of 43.4° brix concentrate) per year, up from less than 10,000 tons annually in the early 1970's (table 19). Domestic sales account for 25 to 30 percent of FCOJ output, with the remainder earmarked for export. Large stocks buildup in years of low exports. An estimated 10,000 tons of concentrate were carried over following the 1979/80 season.

**FCOJ Exports:** Most Mexican orange juice exports consist of 65° brix concentrate packed in 55 gallon

drums (about 52 gallons actual fill). One processor, however, can ship bulk concentrate in tank trucks.

During the 1979/80 season a small processing plant located near the U.S. border was reportedly exporting bulk, single strength orange juice to the United States. U.S. imports of nonconcentrated citrus juices<sup>6</sup> from Mexico were 797,000 gallons (equivalent to 570 to 860 tons of 65° brix concentrate) in calendar year 1980, up from only 21,000 gallons in 1979. U.S. imports of single strength orange juice are subject to a tariff that is 43 percent lower than that charged for concentrated orange juice.<sup>7</sup> With this incentive in mind, other Mexican processors are now exploring the possibility of exporting single strength juice to the United States.

Mexican processors are reportedly able to produce FCOJ with better color and higher sugar-acid ratios than Brazilian concentrate. This makes the Mexican product potentially valuable for blending with lower quality juice from other origins. Because of their

<sup>6</sup>This category includes all citrus juices except lime juice.

<sup>7</sup>Tariff is 35 cents per single strength equivalent gallon for concentrate juices and 20 cents per gallon for single strength juices.

Table 19.—Mexico: Estimated Supply and Distribution of Frozen Concentrate Orange Juice (FCOJ), 1970/71–1979/80

(Metric Tons)

Year	Oranges Processed for Juice <sup>2</sup>	FCOJ, 65° BRIX <sup>1</sup>				
		Beginning Stocks	Production <sup>3</sup>	Domestic Consumption	Exports <sup>4</sup>	Ending Stocks
1970/71 . . . . .	95,000	0	8,000	3,600	1,800	2,600
1971/72 . . . . .	90,000	2,600	7,600	3,600	6,600	0
1972/73 . . . . .	170,000	0	14,300	3,900	10,400	0
1973/74 . . . . .	175,000	0	14,700	3,700	11,000	0
1974/75 . . . . .	160,000	0	13,400	3,800	3,500	6,100
1975/76 . . . . .	140,000	6,100	11,800	4,200	8,500	5,200
1976/77 . . . . .	280,000	5,200	23,500	4,800	23,900	0
1977/78 . . . . .	210,000	0	17,600	4,700	12,900	0
1978/79 . . . . .	250,000	0	21,000	5,500	9,800	5,700
1979/80 . . . . .	220,000	5,700	18,500	6,200	<sup>5</sup> 8,000	10,000

<sup>1</sup> One metric ton of 65° brix concentrate = 200.84 gallons of 65° brix concentrate or 331.6 gallons of 43.4° brix concentrate.<sup>2</sup> In some years includes 5,000-10,000 tons of tangerines. <sup>3</sup> Assumes 1 ton of oranges will yield 84 kg of 65° brix FCOJ or one 90 lb box of oranges will yield 1.14 gallons of 43.4° brix concentrate. <sup>4</sup> Calendar year data from Mexican official trade statistics. Calendar Year 1971 corresponds to 1970/71 marketing year. <sup>5</sup> USDA estimate.

Source: USDA estimates.

relatively small output and exports, Mexican exporters of FCOJ have little influence in determining world prices for their product. They must accept prices that have been determined in Florida and Brazil, and which often have no relationship to their costs. As a result, processors are sometimes hesitant to sell when world prices are low, preferring instead to hold on to stocks in the hope that prices will improve.

Citrus juices are not subject to an export tax, but shippers must obtain export licenses. There are no other Government incentives for exports. Mexican exports of FCOJ, shown in table 20, vary widely from year to year. Since 1972 they ranged from 3,500 to 24,000 tons. The principal market is the United States, which has taken, on the average, about 40 percent of Mexican exports.

U.S. imports from Mexico were 1,559 metric tons of 65° brix concentrate (517,000 43.4° brix gallons) in calendar year 1980, down substantially from the peak imports of 9,901 tons in 1977 (table 21). The relatively high imports in 1977 were in response to the damage done to the Florida orange crop by a freeze in January of that year. Mexico accounted for only

2 percent of U.S. concentrated orange juice imports in 1980. The January, 1981 freeze in Florida is likely, however, to cause another spurt in U.S. imports of Mexican FCOJ. Given recent increases in Brazil's productive capacity, Mexico is unlikely to duplicate import shares as high as the 28 and 29 percent levels achieved in the mid-1970's.

**Domestic Market for FCOJ:** The Mexican domestic market now absorbs about 25 to 30 percent of the country's output of FCOJ. No recent data are available, but trade sources believe domestic sales have been growing. Processors are interested in developing this market and in directing a larger share of their output toward it because of its stability relative to the export trade. Growth is limited, however, by consumer preference for freshly squeezed juice, high prices for processed products, and the low incomes of most Mexican consumers.

The most important consumer products sold in the internal Mexican market are chilled orange drinks and chilled single strength orange juice sold in paper cartons. Most of these products are distributed by dairies who purchase the bulk product from the processors, reconstitute it, and package it. In terms of single

strength juice equivalent, the approximate market share held by each product in 1977 or 1978 was:

	Percent
Chilled orange drinks in paper cartons	40
Chilled single strength orange juice in paper cartons	38
Orange juice concentrate in paper cartons	4
Canned single strength orange juice	11
Bottled single strength orange juice	5
Soft drink bases	2

Source: Calculated from: Edgar E. Mora Blancas, "La Fruticultura Mexicana," in Manuel de Castillo

Trulin, ed., *Memoria del Seminario de Citricultura*, Banco de Mexico-FIRA, Mexico, DF, 1979.

Mexican law requires orange juice to be at least 12° brix, and orange drinks must contain at least 40 percent juice to escape the soft drink excise tax. Soft drink prices are subject to Government controls, but orange drink and orange juice prices are not.

**Frozen Concentrate Grapefruit Juice:** Estimated Mexican production of FCGJ more than doubled between 1977/78 and 1978/79. The growth is mainly attributable to good export demand for the product, but growing domestic consumption and bigger grapefruit crops were also important factors.

Table 20.—Mexico: Exports of Frozen Concentrate Orange Juice (FCOJ), by Country of Destination, Calendar Years 1970–1979  
(Metric Tons of 65° Brix Concentrate<sup>1</sup>)

Country of Destination	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Australia . . . . .	—	—	—	—	939	1,392	2,621	761	—	383
Austria . . . . .	—	—	—	37	—	142	—	—	—	—
Bahamas . . . . .	—	172	57	3,021	904	—	501	2,058	2,719	174
Canada . . . . .	—	566	1,499	1,404	1,226	1,020	1,489	5,797	2,490	2,472
Finland . . . . .	—	—	—	—	—	95	—	270	—	—
West Germany . . . . .	688	18	217	11	—	—	116	635	—	—
Netherlands . . . . .	—	34	—	—	322	—	—	—	—	—
Sweden . . . . .	3	27	320	514	873	384	1,500	4,432	537	—
Switzerland . . . . .	116	—	—	—	—	—	—	—	—	—
United Kingdom . . . . .	—	23	—	—	—	—	513	2,415	1,762	—
United States . . . . .	—	967	4,548	5,390	6,779	507	1,721	7,450	5,231	6,728
Other . . . . .	1	—	1	—	—	1	—	127	151	64
Total . . . . .	808	1,807	6,642	10,377	11,043	3,541	8,461	23,945	12,890	9,821

—Denotes zero or less than 500 kg.

<sup>1</sup> One metric ton = 200.84 gallons of 65° brix concentrate or 331.6 gallons of 43.4° brix concentrate.

Source: Official trade statistics of Mexico.

Table 21.—United States: Imports of Concentrated Orange Juice from Mexico  
Calendar Years 1970–1980

Year	65° Brix	43.4° Brix Equivalent	Mexico's Share of Total U.S. Imports
	<i>Metric Tons</i>	<i>1,000 Gallons</i>	<i>Percent</i>
1970 . . . . .	108	36	10
1971 . . . . .	854	283	6
1972 . . . . .	4,111	1,363	15
1973 . . . . .	4,254	1,410	29
1974 . . . . .	3,705	1,229	28
1975 . . . . .	2,380	789	10
1976 . . . . .	1,058	351	5
1977 . . . . .	9,901	3,283	29
1978 . . . . .	7,079	2,348	7
1979 . . . . .	5,296	1,756	5
1980 . . . . .	1,559	517	2

Source: U.S. Department of Commerce, Bureau of Census.



FCGJ for export is usually shipped in 55 gallon drums of 58° brix concentrate. Exports in recent years have been as follows (in metric tons):

<i>Destination</i>	<i>1976</i>	<i>1977</i>	<i>1978</i>	<i>1979</i>
United States . . .	0	N.A.	472	1,665
West Germany. . .	0	N.A.	0	1,343
Canada . . . . .	2	N.A.	113	585
Other . . . . .	162	N.A.	10	198
Total . . . . .	163	N.A.	595	3,791

N.A. indicates not available.

Source: Official trade statistics of Mexico.

U.S. data show calendar year 1980 imports from Mexico of only 115,000 gallons, single strength equivalent, of concentrated citrus juice<sup>8</sup> (equal to 80 or 90 tons of 58° brix concentrate). This was a decrease from 770,000 gallons imported in 1979.

**Dried Citrus Pulp:** Most Mexican citrus processors produce citrus pulp meal as a byproduct of their concentrate juice operations. Annual output in recent years has probably been around 25,000 tons, all of which has been sold domestically for dairy cattle feed. The product is not pelletized.

**Citrus Sectioning Industry:** Mexico's first citrus sectioning plant was set up in the mid-1960's, but production did not reach significant proportions until the 1976/77 season. Growth since then has been rapid with production rising from about 1,000 tons of grapefruit sections, orange sections, and citrus salad in 1976/77 to about 8,300 tons in 1979/80 (table 22). Practically all of Mexico's output of citrus sections and citrus salad is exported to the United States.

There are now five citrus sectioning plants in Mexico: one in Montemorelos, Nuevo León; two in Linares, Nuevo Leon; one in Santa Engracia, Tamaulipas; and one in Nuevo Laredo, Tamaulipas which is a border town opposite Laredo, Texas. There are currently plans to construct at least three more sectioning plants—one in General Teran, Neuvo León and two in Veracruz. As of early 1981, construction had begun on at least one of these new facilities.

Citrus sectioning plants generally use cull fruit from fresh citrus packinghouses for their raw material. Sectioning in all plants is done by hand. The finished product is shipped in one gallon glass jars as well as in 30- and 45-lb containers. In addition to the usual grapefruit and orange sections, citrus salad shipments usually contain about 15 percent pineapple.

<sup>8</sup>Category includes all except lime and orange juice. In the case of Mexico, it is practically all grapefruit juice.

U.S. imports of citrus sections and citrus salad from all origins were about 13,000 tons in 1979/80<sup>9</sup>, and accounted for about 43 percent of U.S. availability<sup>10</sup> of these products. Mexico supplied about 64 percent of imports in 1979/80. By product, the Mexican share of U.S. imports was 51 percent for grapefruit sections, 62 percent for orange sections, and over 90 percent for citrus salad. Israel supplied most of the remaining U.S. imports, although a small amount, around 4 percent of the total, originated in other countries, mainly Ecuador, Spain, South Africa, and Brazil.

## Mexican Lime Processing

In recent years, around 45 percent of Mexican (key) lime production has been processed. The most important product is essential oil of lime, but in recent years increasing amounts of byproducts have been produced. Mexico is the world's largest producer and exporter of lime oil. The production and processing data in table 23 are estimates. There is no published information on lime oil production and carryover stocks.

There are between 50 and 60 lime oil producing facilities in Mexico. A little over one-half of these are in the State of Colima, mostly in the city of Tecomán. Most of the remainder are in the Apatzingán area of Michoacán, but there are also distilleries in the States of Guerrero, Oaxaca, Veracruz, and Tamaulipas. The processing season runs from March to November, when lime supplies are the heaviest.

Most lime oil producing plants are small, quite unelaborate distilleries, which are usually associated with fresh packing operations. Most either have no equipment for recovering byproducts, or recover only a low quality lime juice. In recent years, however, a few modern lime oil extraction facilities have been constructed. In addition to essential oil, these facilities produce a good quality juice, plus dried pulp and peel for cattle feed, and, in a couple of instances, pectin. Many lime oil distilleries are owned by large growers who produce their own fruit for processing and may, or may not, buy additional fruit from independent growers. A few processing plants, especially ones that work with ejido growers, are owned by Government agencies.

Mexico exports about 90 percent of its lime oil production, and the United States is the destination for

<sup>9</sup>Grapefruit sections, 5,700 tons; orange sections, 4,500 tons; and citrus salad, about 2,800 tons (the estimated weight of pineapples is deducted from the citrus salad figure).

<sup>10</sup>Availability is production (based on the assumption that Florida accounts for 90 percent of the total), less exports, plus imports.



Table 22.—Mexico: Estimated Production of Citrus Sections, 1976/77-1979/80

(Metric Tons)

Year	Fruit Utilized <sup>1</sup>			Sections Produced <sup>2</sup>			
	Grapefruit	Oranges	Total	Grapefruit Sections	Orange Sections	Citrus Salad <sup>3</sup>	Total
1976/77 . .	2,000	1,000	3,000	0	0	1,000	1,000
1977/78 . .	9,000	8,000	17,000	<sup>4</sup> 1,300	<sup>4</sup> 1,700	2,800	5,800
1978/79 . .	15,000	9,000	24,000	3,100	2,000	3,000	8,100
1979/80 . .	14,000	11,000	25,000	2,900	2,800	2,600	8,300

<sup>1</sup> Rounded to the nearest 1,000 metric tons. The weight of fruit utilized is approximately three times the weight of the sections produced. <sup>2</sup> U.S. imports according to the Census Bureau, rounded to the nearest 100 metric tons. <sup>3</sup> Eighty percent of U.S. imports of mixed fruit, prepared and preserved. Most of the remaining fruit in this category consists of pineapples. It is assumed that citrus salad consists of two parts grapefruit sections and one part orange sections. <sup>4</sup> Partially estimated.

Source: USDA estimates.

Table 23.—Mexico: Estimated Production and Processing of Mexican Limes, and Production of Lime Oil, 1970/71–1979/80

(Metric Tons)

Year	Mexican Limes		Lime Oil Production <sup>1</sup>
	Production	Processed	
1970/71. . . .	330,000	80,000	288
1971/72. . . .	310,000	70,000	252
1972/73. . . .	270,000	90,000	324
1973/74. . . .	270,000	100,000	360
1974/75. . . .	300,000	120,000	432
1975/76. . . .	300,000	110,000	396
1976/77. . . .	320,000	90,000	324
1977/78. . . .	361,000	170,000	612
1978/79. . . .	415,000	180,000	648
1979/80. . . .	430,000	200,000	720

<sup>1</sup> 3.6 kilograms of lime oil per metric ton of limes.

Source: Mexican lime production data for 1975/76, 1977/78, and 1978/79 are Fidecomiso de Limon (Fidelim) estimates. Other years are USDA estimates. Lime processing and lime oil production estimates were developed around the following assumptions: 1 metric ton of limes yields 3.6 kg of essential oil, 90 percent of the lime oil produced is exported, 90 percent of exports are destined to the United States, and that Mexican exports and U.S. imports for calendar 1970 correspond to the 1970/71 marketing year, 1971 corresponds to the 1971/72 marketing year, and so on.

80 to 95 percent of exports (tables 24 and 25). The United Kingdom is the only other major market. Export shipments are heaviest during May to December.

Lime juice exports (table 26) are small, but have increased in recent years as a few modern processors have come into production. The United States and Canada have displaced the United Kingdom as the main export market for lime juice.

Lime oil exports are channelled through two export pools. The oldest and largest is the National Union of Lime Oil Producers—UNPAL, which was founded in 1943 when Mexico began exporting large quantities of lime oil. UNPAL, which includes 48 or 50 distilleries, accounted for 60 percent of Mexico's lime oil exports in 1978. The other pool is operated by the Federal Government's Citrus and Tropical Fruit Trust Fund (formerly the Lime Trust Fund or Fidelim) and handles exports for five or six distilleries. In 1979, two of the distilleries represented by the Trust Fund pool were privately owned, and the remainder were Government owned. This pool, which began operations in 1974, handled 40 percent of Mexico's lime oil exports in 1978.

Table 24.—Mexico: Exports of Lime Oil, 1970–1979

(Metric Tons)

Year	Country of Destination			
	United States	United Kingdom	Others	Total
1970 . . . . .	172	8	14	194
1971 . . . . .	289	6	15	310
1972 . . . . .	204	32	20	256
1973 . . . . .	262	60	19	341
1974 . . . . .	357	63	20	440
1975 . . . . .	324	15	7	346
1976 . . . . .	274	42	14	330
1977 . . . . .	474	70	38	582
1978 . . . . .	574	130	22	726
1979 . . . . .	538	187	23	748

Source: Official trade statistics of Mexico.

Table 25.—United States: Imports of Lime Oil from Mexico, 1970-80

Year	Imports from Mexico	
	Metric Tons	Percent of Total Lime Oil Imports
1970 . . . . .	222	59
1971 . . . . .	215	65
1972 . . . . .	279	65
1973 . . . . .	281	63
1974 . . . . .	342	65
1975 . . . . .	282	66
1976 . . . . .	235	54
1977 . . . . .	429	68
1978 . . . . .	473	64
1979 . . . . .	515	63
1980 . . . . .	377	59

Source: U.S. Department of Commerce, Bureau of Census.

Table 26.—Mexico: Exports of Lime Juice, 1970–1979<sup>1</sup>

(Metric Tons)

Year	Country of Destination								Total
	United States	Canada	United Kingdom	Belgium	West Germany	Japan	Switzerland	Others	
1970 . . .	79	0	0	0	47	20	0	0	146
1971 . . .	65	1	133	0	0	34	0	63	296
1972 . . .	271	0	154	0	0	13	0	17	455
1973 . . .	6	10	358	0	0	67	0	90	531
1974 . . .	169	0	1,056	0	0	0	0	1	1,226
1975 . . .	146	33	1,063	0	23	0	5	0	1,270
1976 . . .	169	0	748	13	32	9	4	52	1,027
1977 . . .	1,038	58	559	12	5	11	10	0	1,693
1978 . . .	1,398	1,045	198	159	93	14	12	75	2,994
1979 . . .	1,628	627	NA	145	NA	NA	NA	114	2,514

NA indicates not available.

<sup>1</sup>Probably includes both single strength and concentrated juice.

Source: Official trade statistics of Mexico.

## U.S. EXPORTS OF CITRUS PRODUCTS TO MEXICO

The United States exports around \$1 million to \$2 million worth of fresh citrus and citrus products to Mexico each year (table 27). These exports, with the exception of essential oils, are destined for border areas and do not go into the interior of Mexico.

U.S. fresh citrus exports to Mexico were valued at \$927,000 in 1980. Shipments for a 10-year period are

shown in table 28. In 1978 exports of citrus juices expanded to \$717,000, up from only \$127,000 the previous year. Most of the increase was FCOJ in bulk containers, but shipments of other concentrated juices also grew. In more recent years, exports of nonconcentrated orange juice have grown rapidly.

Table 27.—United States: Exports of Citrus and Citrus Products to Mexico, 1975–1980

(\$1,000)

Commodity	1975	1976	1977	1978	1979	1980
<b>FRESH CITRUS</b>						
Tangerines . . . . .	6	4	1	3	11	237
Temple oranges . . . . .	(1) <sup>1</sup>	(1)	(1)	22	1	33
Other oranges . . . . .	<sup>1</sup> 94	<sup>1</sup> 105	<sup>1</sup> 100	39	22	88
Limes . . . . .	54	82	76	26	50	42
Lemons . . . . .	112	190	114	115	114	116
Grapefruit . . . . .	18	26	104	17	9	20
Other citrus . . . . .	15	81	17	148	18	391
<b>PROCESSED CITRUS</b>						
Grapefruit, prep. or pres. . . . .	0	0	0	6	1	0
Other citrus, prep. or pres. . . . .	0	0	0	10	2	6
Orange juice, conc., froz. . . . .	19	4	11	393	204	261
Orange juice, conc. . . . .	8	2	1	39	13	37
Orange juice, not conc. . . . .	153	194	69	97	234	302
Grapefruit juice, conc., froz. . . . .	1	1	0	70	162	163
Grapefruit juice, conc. . . . .	8	7	7	24	12	12
Grapefruit juice, not conc. . . . .	39	19	34	37	55	67
Other citrus juice, conc., froz. . . . .	0	0	0	49	148	105
Other citrus juice, conc. . . . .	0	0	0	0	4	15
Other citrus juice, not conc. . . . .	1	3	5	8	15	30
Orange oil . . . . .	3	14	3	46	57	145
Lemon oil . . . . .	3	9	9	33	232	89
Total citrus and products . . . . .	535	741	551	1,182	1,364	2,159

<sup>1</sup> Temples included with other oranges.

Source: U.S. Department of Commerce, Bureau of Census.

Table 28.—United States: Exports of Fresh Citrus to Mexico, 1970/71–1979/80

(Metric Tons)

Season <sup>1</sup>	Oranges <sup>2</sup>	Tangerines <sup>3</sup>	Grapefruit	Lemons
1970/71 . . . . .	172	0	54	1,951
1971/72 . . . . .	66	57	303	814
1972/73 . . . . .	71	28	95	161
1973/74 . . . . .	46	23	41	615
1974/75 . . . . .	287	23	105	658
1975/76 . . . . .	831	8	174	1,061
1976/77 . . . . .	579	10	220	638
1977/78 . . . . .	275	1	148	668
1978/79 . . . . .	90	28	45	530
1979/80 . . . . .	335	670	47	404

<sup>1</sup> Season for oranges and tangerines begins in Nov.; season for grapefruit begins in Sept.; season for lemons begins in Aug. <sup>2</sup> Includes temple oranges. <sup>3</sup> Includes tangelos.

Source: U.S. Department of Commerce, Bureau of Census.



# APPENDIX TABLES

Appendix Table 1.—United States: Imports of Citrus and Citrus Products from Mexico 1978–1980

(\$1,000)

Commodity	1978	1979	1980
<b>FRESH CITRUS</b>			
Oranges . . . . .	2,272	4,926	1,806
Tangerines . . . . .	5,776	3,818	3,559
Limes . . . . .	3,035	4,225	4,669
Lemons . . . . .	6	5	0
Grapefruit . . . . .	325	1,001	1,137
Other citrus . . . . .	0	1	0
Total fresh citrus . . . . .	11,414	13,796	11,171
<b>PROCESSED CITRUS PRODUCTS</b>			
Oranges, prep. or pres. . . . .	1,207	1,438	1,412
Grapefruit, prep. or pres. . . . .	974	1,438	1,495
Fruit mixtures, prep. or pres. . . . .	2,278	2,307	918
Orange juice, conc. . . . .	8,826	6,041	1,506
Lime juice, conc. . . . .	594	969	351
Lime juice, not conc. . . . .	159	12	17
Other citrus juices, conc. . . . .	73	580	133
Other citrus juices, not conc. . . . .	16	43	1,090
Orange oil . . . . .	—	0	0
Lime oil . . . . .	9,476	14,692	11,911
Grapefruit oil . . . . .	0	0	8
Other citrus oils . . . . .	0	51	0
Total processed citrus . . . . .	23,603	27,571	18,841
Total, citrus and citrus products . . . . .	35,017	41,367	30,312

—Indicates less than \$500.

<sup>1</sup> Contains relatively small amount, maybe 20 percent, of noncitrus fruit.

Source: U.S. Department of Commerce, Bureau of Census.

Appendix Table 2.—Mexico: Estimated Production of Citrus Fruit, 1960/61-1969/70<sup>1</sup>

(1,000 Metric Tons)

Year	Oranges	Tangerines	Grapefruit	Limes <sup>2</sup>	Total Citrus
1960/61 . . . . .	730	70	15	150	965
1961/62 . . . . .	560	40	15	150	765
1962/63 . . . . .	470	60	15	170	715
1963/64 . . . . .	540	50	15	180	785
1964/65 . . . . .	650	70	20	180	920
1965/66 . . . . .	720	60	20	220	1,020
1966/67 . . . . .	770	100	30	250	1,150
1967/68 . . . . .	880	80	30	280	1,270
1968/69 . . . . .	1,000	120	45	280	1,445
1969/70 . . . . .	1,150	100	40	300	1,590

<sup>1</sup> Rough approximations.

<sup>2</sup> Mexican limes only. Production of Persian limes was insignificant during this period.

Source: USDA estimates.

Appendix Table 3.—Mexico: Exports of Citrus and Citrus Products, 1960-69

(Metric Tons)

Year	Fresh Citrus				Citrus Products	
	Oranges	Tangerines	Grapefruit	Limes	FCOJ 65° Brix	Lime Oil
1960 .....	23,737	—	—	824	2,616	65
1961 .....	30,579	—	—	1,311	3,207	128
1962 .....	10,015	—	<sup>1</sup> 152	866	2,264	265
1963 .....	42,267	4,498	677	2,195	2,619	255
1964 .....	59,420	11,825	1,543	1,811	4,305	85
1965 .....	79,093	8,101	118	1,050	775	289
1966 .....	25,633	5,989	93	661	465	279
1967 .....	29,781	15,651	52	368	177	399
1968 .....	62,060	20,594	984	294	797	367
1969 .....	32,596	19,759	1,291	254	282	150

—Indicates zero or not available.

<sup>1</sup> June-December only.

Source: Official trade statistics of Mexico.

Appendix Table 4.—United States: Imports of Citrus and Citrus Products from Mexico, 1960-1969

(Metric Tons)

Year	Fresh Citrus			Citrus Products	
	Oranges and Tangerines	Grapefruit	Limes	FCOJ 65° Brix	Lime Oil
1960 .....	9,805	0	2,081	1,354	80
1961 .....	8,512	0	2,660	1,440	167
1962 .....	12,566	433	1,985	798	246
1963 .....	51,233	62	2,218	1,155	246
1964 .....	50,184	981	1,857	2,849	97
1965 .....	31,751	40	1,549	190	259
1966 .....	21,680	47	1,547	17	266
1967 .....	22,844	16	1,142	0	348
1968 .....	53,017	211	1,190	546	337
1969 .....	29,285	831	1,328	126	133

Source: U.S. Department of Commerce, Bureau of Census.

Appendix Table 5.—Mexico: Area and Production of Mexican (Key) Limes by State, 1978/79

State	Number of Trees			Planted Area	Production
	Bearing	Nonbearing	Total		
	—1,000 Trees—			—Hectares—	—Metric Tons—
Colima <sup>1</sup> .....	2,016	804	2,820	27,671	240,374
Michoacán <sup>1</sup> .....	1,236	187	1,423	11,926	102,492
Guerrero .....	456	27	483	5,054	35,613
Oaxaca .....	356	126	482	5,276	28,962
Tamaulipas .....	131	35	166	1,174	7,749
Total .....	4,195	1,179	5,374	51,101	415,190

<sup>1</sup> Municipality of Coahuayana, Michoacán is included with Colima.

Source: Fidecomismo de Limón (Fidelím).

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